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HEAVY DUTY VEHICLE DRIVING PATTERN AND
USE SURVEY. PART 1, NEW YORK CITY

John C. Cosby

Wilbur Smith and Associates

Prepared for:

Environmental Protection Agency

May 1973

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HEAVY DUTY VEHICLE PB 221 656
DRIVING PATTERN AND USE SURVEY

FINAL REPORT

PART I

NEW YORK CITY

Prepared For
ENVIRONMENTAL PROTECTION AGENCY
AND
COORDINATING RESEARCH COUNCIL, INC.

APRAC CAPE 21-71

By
Wilbur Smith and Associates
May, 1973

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PART I

NEW YORK CITY

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Mobile Source Air Pollution Control
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May 1973

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Material contained in this report is partially based upon the 1963 Truck Origin-Destination Survey conducted by the **Tri-State Regional Planning Commission**. The Commission made these survey records available to Wilbur Smith and Associates for their subsequent reprocessing and use. The latter organization is solely responsible for the analyses and interpretations derived therefrom and used in this report.

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Chapter 1

INTRODUCTION

This report presents data collated from various sources which identify the composition, function and travel behavior of urban truck travel in New York City. From the data, various stratifications have been organized to permit the characterization of mission, function and use patterns of trucks operating over urban streets. These stratifications will be employed to develop representative truck-use patterns for development of emission tests.

The study was Phase I of a two-phase program jointly undertaken by the Environmental Protection Agency and the Coordinating Research Council, Inc., under contract CRC APRAC Project No. CAPE-21-71 (1-72). The study objective was to assemble these data for both the Los Angeles Basin and New York City areas from existing data sources. However, data related to the Los Angeles Basin proved to be inconclusive and additional survey activity has been recommended to permit comparative stratifications between both areas. Because of the pressing need for data to proceed with Phase II of the program, it has been decided to publish the final report in two parts. Part I, represented by this document, reports the truck pattern and use data related to New York City. Part II, relating to the Los Angeles Basin, will be published subsequently when supplemental studies in that area have been completed.

Phase II of the program will be undertaken as a separate contract. This element will select and stratify heavy-duty vehicles, over 10,000 pounds gross vehicle weight. An economical sample of trucks representative of the total population in each area will be instrumented and operated in normal fashion to collect detailed operating profile data of truck operation not now available

in existing data. The data will include the recording of engine speed, vehicle speed and per cent of rated engine torque, plus other data. Processing of these data will provide truck operating profile data required to develop emission testing procedures, including a representative engine test cycle for emission control measure qualification of new engine designs.

The Work Program

The work program was divided into four tasks:

Task 1. Orientation and Available Information - This effort was the identification and collection of available information on urban trucks and truck usage from existing literature, vehicle registration records, urban truck weight (loadometer) studies, comprehensive urban area transportation planning studies, fleet operator statistics and other available data sources for the Los Angeles and New York City areas.

Task 2. Analysis of Vehicle Characteristics and Truck Use Variables - Meaningful characteristics of the urban truck population were assembled from the information derived in Task 1 by detailed stratification and analysis to reduce and simplify the number of categories of trucks and the kinds of travel they perform.

Task 3. Analysis of Truck-Use Patterns - The travel performed by each of the major classes of vehicles defined in Task 2 were examined in relation to place and time and extent of use, type of street traveled, place and length of time at rest, vehicle miles of travel by geographic unit of area and street type, and land-use traversed. Two general sets of data resulted--the general characteristics of truck use and the spatial patterns of truck use on the street network.

Task 4. Data Deficiencies and Requirements - In the process of assembly and analysis of available data, additional information was identified as needed to improve the analysis.

Data Sources for the New York City Area

The New York City area is geographically unique in that natural barriers practically surround it, forcing most external traffic to cross one of the bridges or pass through tunnels under rivers. Since these facilities, for the most part, charge tolls, very good statistical data on the nature and frequency of truck traffic was available. Within the area, three islands contain four of the five boroughs. Interchange of traffic between these boroughs is accomplished by strategic bridge and tunnel crossings, tending to channelize inter-borough travel.

An important data base for the study was a Truck-Taxi Survey conducted in 1963 by the Tri-State Transportation Committee (the forerunner of the Tri-State Regional Planning Commission). The geographical area covered by the Truck-Taxi Survey, termed the Cordon Area, includes the areas surrounding New York City in the three states of New York, New Jersey and Connecticut. A three percent random sampling of trucks and taxis registered within the defined cordon area was designed and conducted for that study. The sample was selected in three independent subsamples of 1 percent each with varying degrees of preliminary geographic stratification.* A total of 14,623 interviews were assigned. Completed truck interviews totaled 10,510, for a completion of the entire survey of 72 percent. After adjusting for 1,275 out-of-scope sample units never assigned to interviewers, the completion rate was computed to be 78 percent. The survey total trips reported was 74,031, with an average number of trips per interview of 7.04. Of the completed interviews, 3,505 truck owners reported no trips.

* A summary of sample selection methods is given in TRUCK-TAXI FIELD OPERATIONS REPORT, August 1965, Tri-State Transportation Committee; with a treatment in greater detail in Technical Report #4005-2273, Tri-State Transportation Committee.

Since the objectives of the CAPE 21-71 Study was the New York City area, a special sort of these data was obtained from the Tri-State Regional Planning Commission. This sort selected only trucks reporting trips with either origin, destination or both origin and destination within New York City. This compression of data resulted in data on 1,047 trucks making 10,665 internal trips and 643 trips with one trip end (internal-external) within New York City.

To obtain registration data for the study, a sample of 1971 truck registrations by county for the 9-county area was obtained from R. L. Polk and Company. Polk processes data for the New York State Department of Motor Vehicles under contract and is the sole source for these data. Nineteen Hundred Seventy-one was the earliest year available. Trucks of the last 10 model years are included. A random sort was performed of every 10th truck over 6,001 pounds GVW. A total of 7,547 trucks in the 9-county area resulted.

Another important data source was the traffic count data taken at approximately 275 cordon points during the period of 6 A.M. to 8 P.M. or 2 P.M. to 8 P.M. for a typical weekday in 1962-63. Since these cordon points were associated with expressways, parkways and principal urban arterials, and were dispersed strategically throughout the area, these volumes were assigned to a network of these facilities and used to estimate vehicle miles of travel by vehicle type performed on these categories of roadways.

Average travel speed from the Tri-State street inventory and land-use planning data were associated with this network to present the nature of the travel in various zones within the city.

A summary of study data source, information available and use in the study is given in Table 1.

Table 1

DATA SOURCE SUMMARY

NEW YORK AREA

DATA SOURCEINFORMATION AVAILABLEUSE IN STUDY

1. Origin-Destination Truck Surveys

- a) Tri-State 1963 Truck-Taxi Survey (Tri-State Regional Planning Commission)

Sample interview surveys for all trucks over 6,000 pounds registered in the three-state planning region. Truck data: axles and weights, type of industry, owned or rented vehicle. Trip data: origin-destination, land use, commodity type, density, weight, trip time, trip elapsed time, and trip air-line distance.

This source provided the basis for determining the essential characteristics of truck use. Data were sorted for all trucks whose origins and/or destinations relate to N.Y.C. Relationships developed can be applied to the present truck population.

- b) Trans-Hudson Vehicular Origin-Destination Survey - 1970

O-D data for trucks and trailers by percentage for 18 zones west of the Hudson and 15 zones east of the Hudson River. (George Washington, Lincoln, and Holland Crossings)

This source supplemented the nature and volume of external truck trips at the Hudson River screenline.

- c) Staten Island Bridges - 1968 Vehicular Origin/Destination Survey

O-D data for trucks and trailers by percentage for 13 zones north and 12 zones south of Kill Van Kull. (Goethals, Bayonne, and Outerbridge Crossings.)

This source supplemented the nature and volume of external trips between the Staten Island/New Jersey screenline.

2. Motor Vehicle Registration Files

- a) 1971 New York Metro Area Truck Registration File (R. L. Polk & Co.)

10 percent sample of trucks over 6,000 pounds registered in the nine-county New York area with model years within ten years.

Provided an analysis of truck characteristics within present truck population in New York area, vehicle type, licensed gross weight, body style and county location.

DATA SOURCE

Table 1 (Cont'd)

INFORMATION AVAILABLE

USE IN STUDY

3. Roadside Vehicle Classification Surveys	a) "Comparison of Bridge Traffic", City of New York, Division of Bridges. 1965-1970 Annual	24-hour bi-directional counts on 55 bridge crossings, giving number of autos, trucks, and buses.	Provided truck volumes by time of day for major bridge crossings in N.Y.C.-- principally used to determine screenline volumes between the five boroughs of the city.
b) Average Daily Vehicular Crossing at Hudson River, Staten Island, and Port Authority Bridges. 1968-1971	Average counts for total trucks, trucks and tractor trailers for weekdays, Saturdays, Sundays, and Holidays.	Provided truck volumes for Hudson River, East River and Staten Island/New Jersey screenlines. (Port Authority Bridges)	Provided truck volume samples for East River Crossings (Triborough bridges)
c) Traffic Counts for 1964 and 1972 - Triborough Bridge and Tunnel Authority	Sample classification counts by nine vehicle classes for the Triborough, Bronx-Whitestone, Throg Neck Bridges and the Queens-Midtown Tunnel.	Provided truck volume samples for East River Crossings (Triborough bridges)	Of limited application in study. Only three cordon points located near N.Y.C. screenlines--none in N.Y.C.
d) 1966 Truck Weight Study (New York State Department of Transportation)	Statewide study of truck weights by vehicle classes, estimated annual travel by each truck type, estimated ton-miles of cargo carried by highways, trends in axle weight and gross weight frequencies on highways.	A primary data source for determining traffic volumes and vehicle miles of travel on urban expressways and principal arterials in N.Y.C. The expansion of these data to a 24-hour period and assignment to these urban street systems provides detailed insight into truck movements.	A primary data source for determining traffic volumes and vehicle miles of travel on urban expressways and principal arterials in N.Y.C. The expansion of these data to a 24-hour period and assignment to these urban street systems provides detailed insight into truck movements.
e) Vehicle Classification and Vehicle Occurrence Report, 1962-63	Bi-directional hourly volume counts for single unit and tractor trailer categories at approximately 275 cordon points. Counts run from 6 A.M. - 8 P.M. or 1 P.M. - 8 P.M.	Provided truck volumes by time of day for major bridge crossings in N.Y.C.-- principally used to determine screenline volumes between the five boroughs of the city.	Provided truck volume samples for East River Crossings (Triborough bridges)

Applicability of 1963 Survey Data

The primary objective of this study is to provide data for use to develop a stratified sampling plan to be employed in Phase II of the program. The collection and processing of all available data on heavy truck use has been accomplished to fulfill this objective.

Much of the data used in this study was obtained as early as 1963. Many changes have occurred within the study area which could affect the truck driving patterns and use since that time. Comparisons between survey data taken in 1963 with more recent data indicate that certain patterns have changed little in the intervening years. One such comparison is made in times of bridge crossings in Chapter 4.

It is recognized that patterns of through-trips by trucks have changed due to such influences as the development and industrialization of Nassau and Suffolk Counties and the relocation of motor freight terminals. Through-trucks were not contained in the Tri-State survey material because that sample was based upon trucks registered in the area. A majority of through trucks are not registered locally. These trips were made on well defined routes at reasonably efficient speeds. Therefore, it is felt that VMT generated by through trucks are not a major contributor to motor vehicle emissions in the urban area and their omission in Phase II is reasonable.

Conclusions drawn from Phase I data are tentative and need to be in rough order of magnitude only. The information will be used to intelligently sample the truck population in New York City during the Phase II Survey. It is expected that any significant shifts in truck driving pattern and use will be reflected in that data.

Chapter 2

TRENDS IN TRUCK REGISTRATIONS

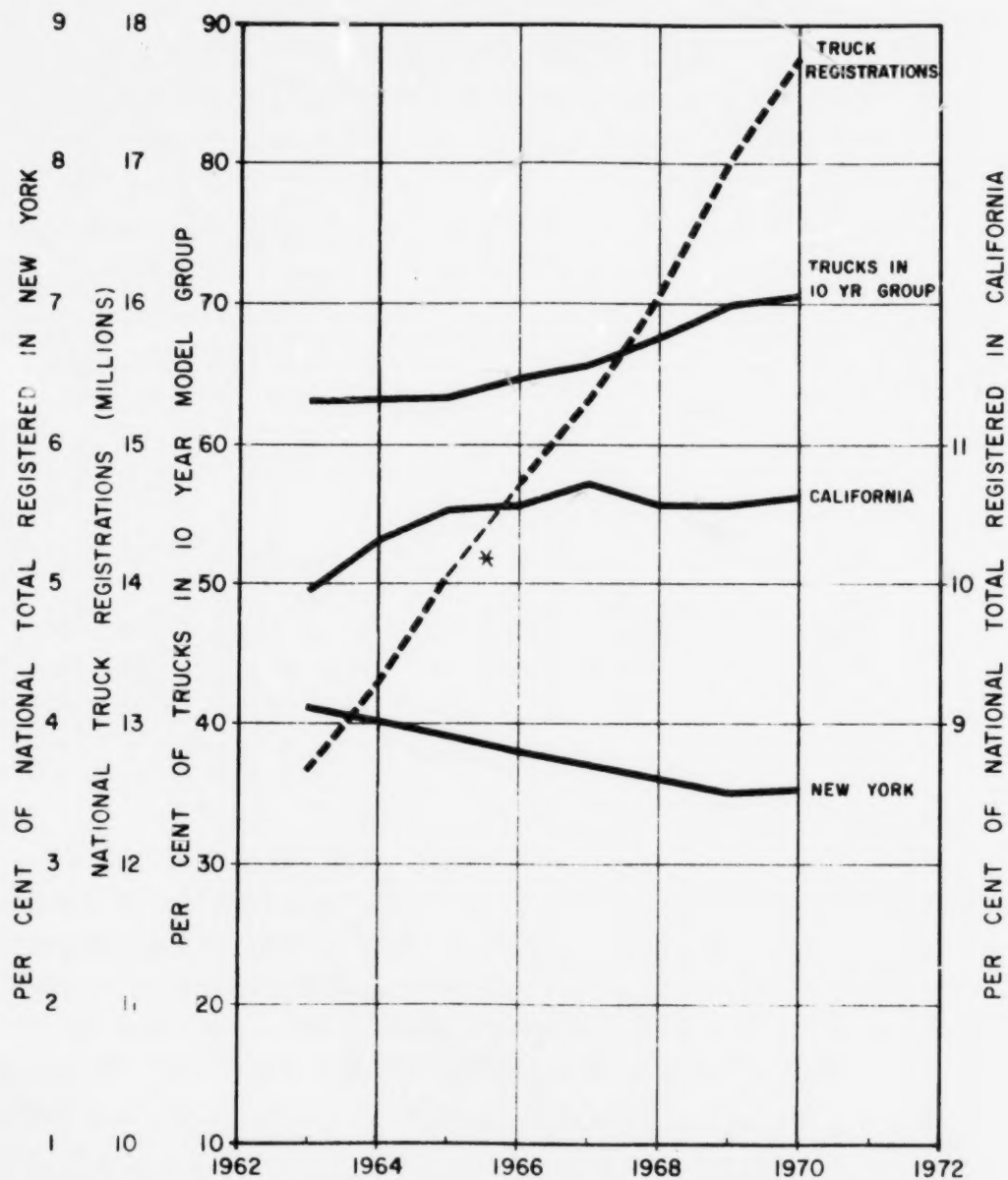
The two selected study areas can be anticipated to differ in some degree in truck use patterns because of differences in many characteristics. Los Angeles typifies the younger city, whose major growth occurred after motor vehicle use was fairly well established. Its street and freeway network has therefore developed with this growth and is more responsive to traffic demands.

On the other hand, the New York City area was well established before the advent of the motor vehicle. Its street network was principally organized before the motor vehicle was developed. Network update to widen streets and to build limited access expressways has been costly and has not kept up with traffic demand. As a result truck travel in the area is difficult and facilities are congested. This has influenced the patterns of truck use in the area when compared to travel in most of the Los Angeles Basin.

Some preliminary insights into area differences might be inferred from trends in truck registrations in California and New York against national totals, in the share of state registrations of trucks in the Los Angeles County and New York City, in the age distribution of trucks in these two areas, and in the per capita truck registrations.

State Registrations to National Totals

In Figure 1, national truck registrations have grown from about 13 million in 1962 to over 17.6 million in 1970. The percent share of this total truck population registered in



* Beginning in 1966, Certain Vehicles Formerly Classified as Passenger Cars Are Counted as Trucks

TRENDS IN TRUCK REGISTRATIONS NATIONWIDE AND IN THE STATES OF CALIFORNIA AND NEW YORK

Source MOTOR TRUCK FACTS, 1965, 1968, 1971, AMA

Wilbur Smith and Associates

FIGURE 1

California has risen from a little less than 10 percent to about 10.6 percent, being stable at this approximate range over the last six years. Truck registrations in New York State have declined steadily from a little over 4 percent to about 3.5 percent, over the 8-year period.

About 63 percent of the national total of trucks were less than 10 years old in 1963. In the 8-year period, the national truck population has progressively become younger. In 1970, over 70 percent of the nation's truck population was less than 10 years old. The significance of this will be noted shortly.

Study Areas Registrations to State Registrations

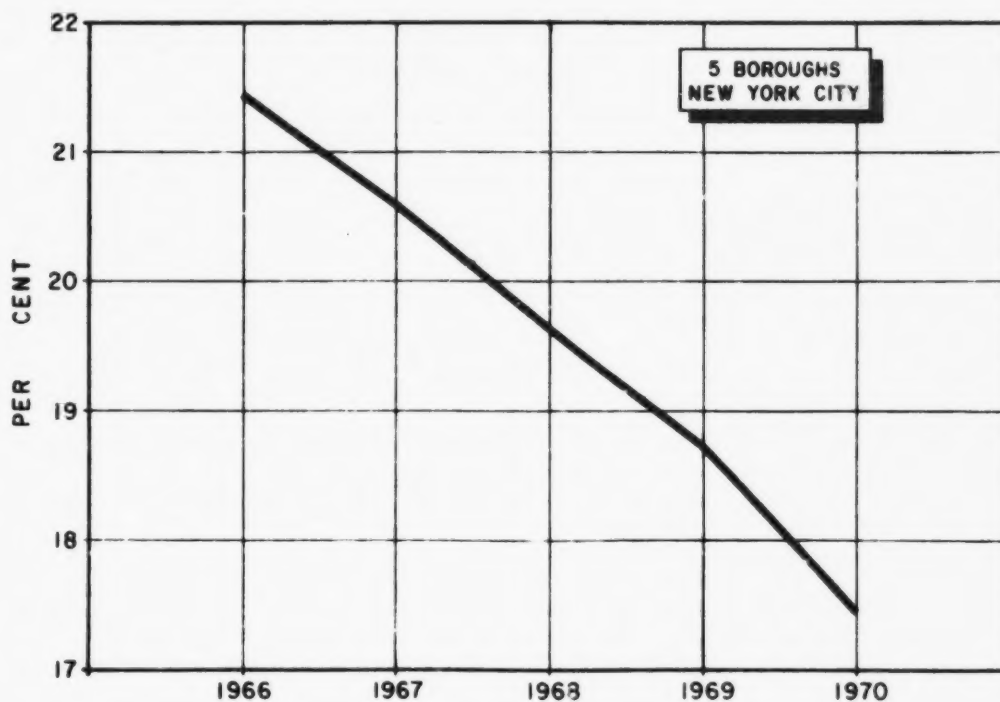
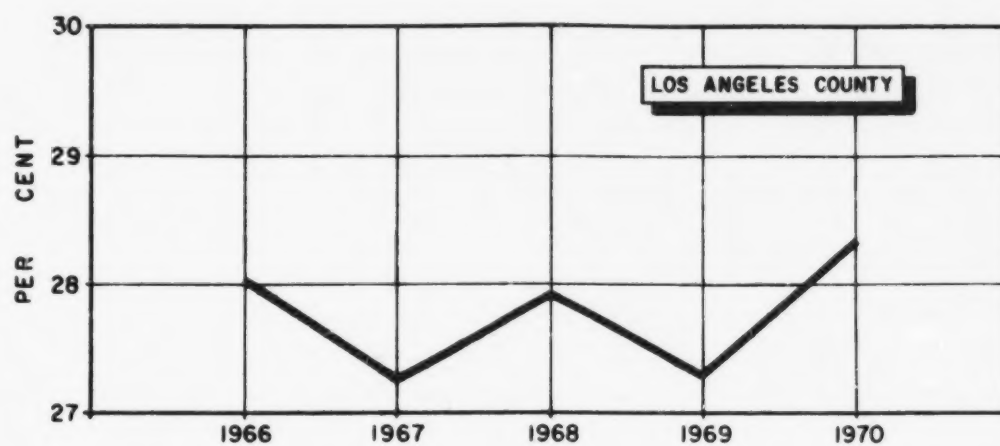
The trend in the share of total state registrations for both study areas is illustrated in Figure 2. Los Angeles County has about 27.8 percent of California truck registrations and has remained fairly constant at this level over the period from 1966 to 1970. Meanwhile truck registrations in New York City as compared to total state registrations have declined almost 4 percent to a share of about 17.5 percent of the total in 1970.

Age Distribution of Truck Population

The distribution of the national average age of trucks from 1967 to 1970 is compared with the age distribution of trucks registered in the nine-county New York area from 1971 registration files is shown in Figure 3. The trend illustrated here shows that the trucks in the 10-year model group tend to contain a higher percentage of older models than the national average.

Per Capita Truck Registrations

Another comparison may be made between per capita truck registrations in the two study areas. Trends in these relationships are shown in Figure 4. In Los Angeles, the number of persons per truck has declined steadily and was about 13 residents

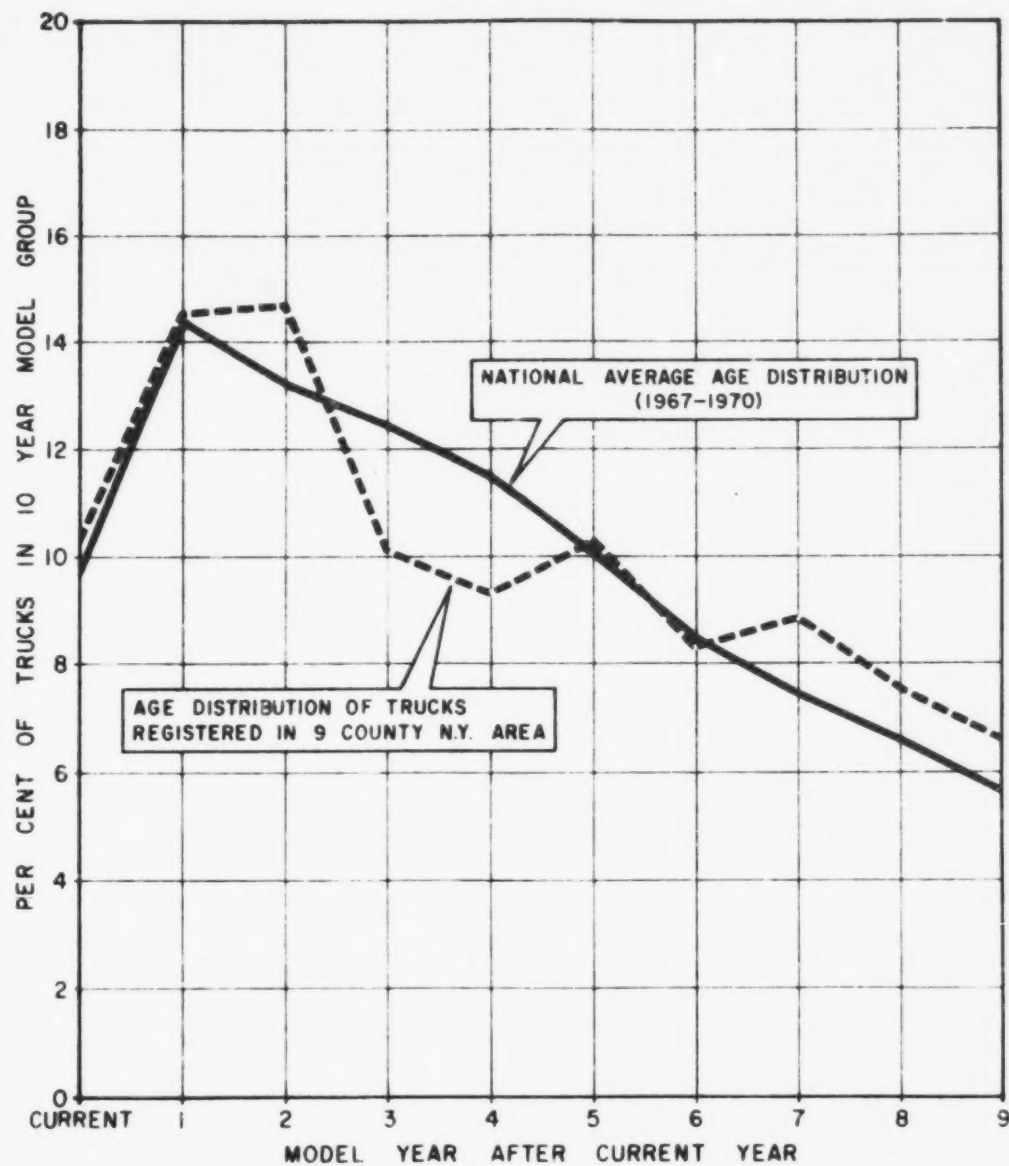


**TRENDS IN TRUCK REGISTRATIONS IN LOS ANGELES
COUNTY AND NEW YORK CITY VERSUS RESPECTIVE STATE
TOTAL TRUCK REGISTRATIONS**

Source: MOTOR TRUCK FACTS, 1966 - 1970.

Wilbur Smith and Associates

FIGURE 2

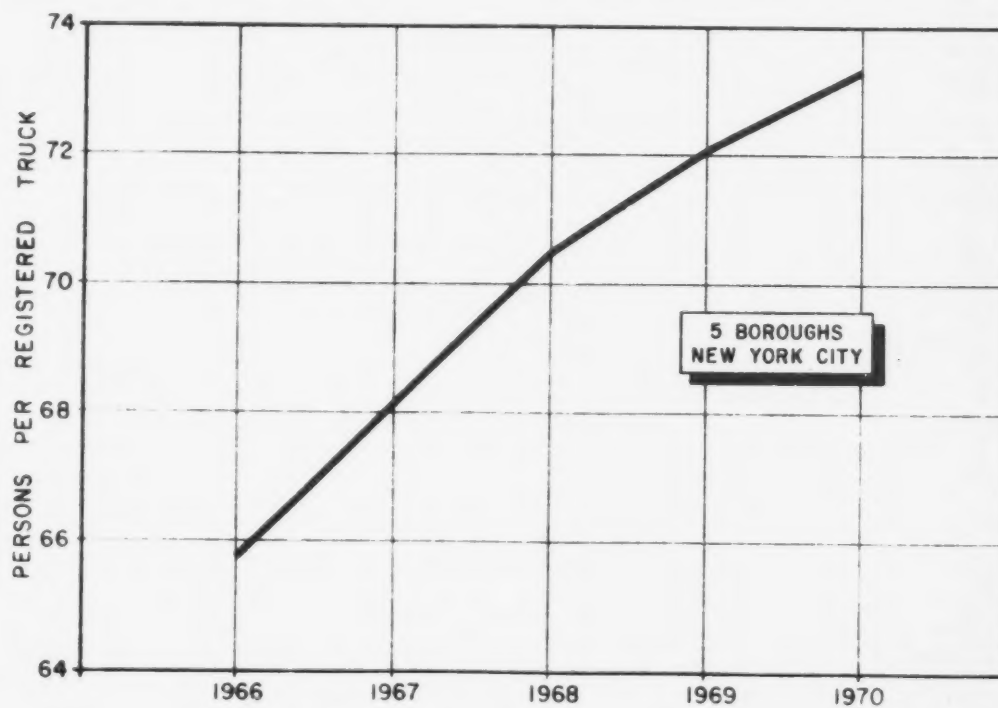
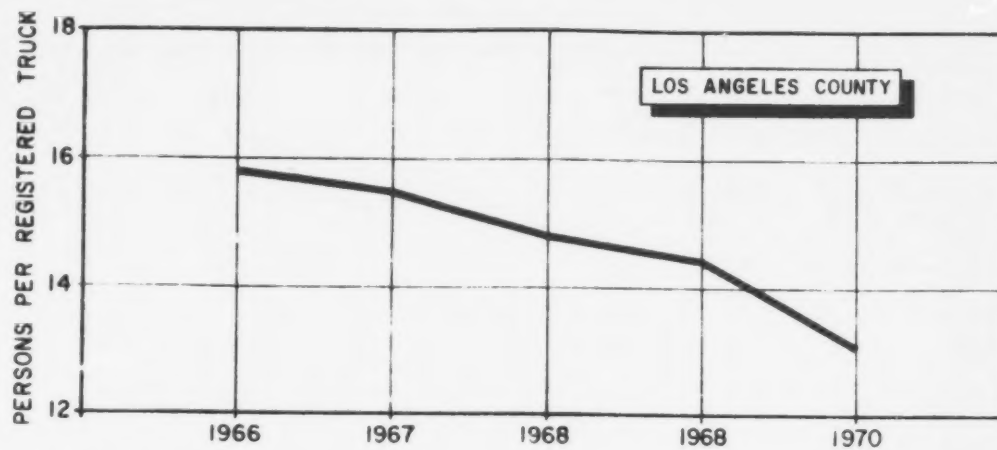


DISTRIBUTION OF TRUCK AGE IN NEW YORK AREA
COMPARED WITH NATIONAL AVERAGE

Source: MOTOR TRUCK FACTS.

Wilbur Smith and Associates

FIGURE 3



TRENDS IN PER CAPITA TRUCK REGISTRATIONS - LOS ANGELES COUNTY AND NEW YORK CITY

Source MOTOR TRUCK FACTS

Wilbur Smith and Associates

FIGURE 4

per registered truck. During the same period, in New York City, this ratio is substantially larger and has increased from a little less than 66 persons per truck to over 73 persons per truck.

Trends in Truck Registrations in the 3-State Area to New York City

Trends in motor truck registrations in the 3-state area of New York, Connecticut and New Jersey are compared with the registrations in the 5 boroughs of New York City in Table 2 . These data are significant in that the upward trend of the 3-state area is not matched with truck registrations solely in New York City. There are several possible explanations for this trend. Among other factors it is known that truck freight terminals have been relocated from the environs of the city to outlying counties. Large truck loads are broken down here and distributed to other destinations, including New York City, by smaller vehicles.

Interpretation of Trend Data

While no attempt is to be made here to explain these variances, for there are many factors involved, it is clear that truck populations are substantially different in the two study areas. It must therefore be anticipated that truck use, extent of truck travel and the number of trips and other factors are likewise in variance in these two study areas.

One purpose of this study was to further identify these differences as well as the similarities of the truck use profiles by comparative means. Data sources, previous study methods and procedures vary in relation to these areas. Care must be exercised in comparisons and use of registration data. It has been observed that registration data often overstate actual population because transfer of ownership of a vehicle does not always require the purging of the previous licensee from the records. Vehicles are registered by the location of the owner's home or commercial operations. The record does not indicate the locale

Table 2

TRENDS IN MOTOR TRUCK REGISTRATIONS
NEW YORK, CONNECTICUT AND NEW JERSEY
5 BOROUGHES OF NEW YORK CITY

	<u>1961</u>	<u>1962</u>	<u>1963</u>	<u>1964</u>	<u>1965</u>	<u>1966</u>	<u>1967</u>	<u>1968</u>	<u>1969</u>	<u>1970</u>
Connecticut ⁽¹⁾	121,117	125,356	129,180	140,850	147,124	151,058	155,194	163,101	168,858	177,453
New Jersey ⁽¹⁾	259,957	268,403	272,580	281,353	292,676	299,251	300,040	305,873	312,873	318,284
New York ⁽¹⁾	502,659	515,697	523,874	539,148	550,568	567,844	570,946	580,809	597,300	631,678
5-Boroughs ⁽²⁾	112,321*	120,635	124,260	112,059	117,086	121,715	117,805	114,051	112,033	110,270
N. Y. C.										

* Includes only Kings, Queens, Bronx and New York Counties for 1961.

SOURCES: (1) MOTOR TRUCK FACTS, AMA, Various annual editions, from U. S. Department of Transportat, Federal Highway Administration (Table MV-1)

(2) R. L. Polk & Co., permission for further use must be obtained from R. L. Polk & Co.

of the vehicle use. With these and other limitations, the results of the study have accomplished its objectives.

Chapter 3

CHARACTERISTICS OF TRUCK POPULATION - NEW YORK CITY

In the analysis of the truck population, the characteristics of trucks must be delineated under defined categories. The selection of these parameters is first limited by the organization of the data source. If two or more sources are used, or if comparisons are to be drawn between two or more areas, care must be exercised to remove any differences which might arise due to definitions, terms, and local practices.

Gross Vehicle Weight

One commonly applied parameter often used to segregate trucks is Gross Vehicle Weight (GVW). This parameter can be found in registration data in those states where licensing is accomplished against this parameter, such as New York State. Thirty six other states also employ this practice. Empty weight is the taxation parameter in 7 states as of July 1971, while a combination of GVW and Empty weight is employed in the remaining 6 states.

Gross vehicle weight has been divided in this study into 7 weight categories.*

- 6-10,000 pounds
- 10-14,000 pounds
- 14-16,000 pounds
- 16-19,500 pounds
- 19.5-26,000 pounds
- 26-33,000 pounds.
- Over 33,000 pounds.

Vehicle Type

Vehicle type is another common characteristic. There are several prevailing definitions of vehicle type. The definition used

* For a calculation of stratum boundaries for GVW related to Tri-State Survey distributions, see Appendix A.

in this study, matching both registration data and truck survey data is as follows:

- 2-axle/single rear tires
- 2-axle/dual rear tires
- 3-axle/dual rear tires
- 3-axle/combination tractor-trailer
- 4-axle/combination tractor-trailer
- 5-axle/combination tractor-trailer
- Other

The first three categories are single-unit trucks while the remaining are tractor-trailer combinations (no full trailer operation is permitted on public highways in New York.)

Body Type

A truck characteristic used in some stratifications is that of body type. Variations between registration data definitions and survey data do occur but are relatively minor, as indicated below:

<u>Registration Data</u>	<u>Survey Data</u>
Compact Van	<u>Single Unit</u>
Dump	Panel
Flat-bed	Pick-up
Panel	Step-in Delivery
Pick-up	Tank
Refrigerator	Van
Stake body	Stake
Tank	Dump
Tractor	Other
Van	<u>Combination</u>
Wrecker	Van
	Dump
	Flat-bed
	Other

One difference appears in the above listing. Registration data indicate the tractor as a separate element not associated with a specific semitrailer, whereas, survey data includes both elements as a combination.

Type of Fuel

Type of fuel is a characteristic often included in registration data. In the case of the Tri-State Survey, this information was not included.

Truck User Characteristics

Another set of categories of truck characteristics relate to those of its user. While these are not readily obtainable from registration data, they were collected in the Tri-State Survey. Fleet size can be implied from the number of vehicles garaged at the same address included in that data. Eleven broad categories of types of industry in which the user was engaged were coded as follows:

<u>Code Descriptor</u>	<u>Code Descriptor</u>
0 Agricultural	6 Finance
1 Construction	7 Professional
2 Manufacturing	8 Repair
3 Utility, Communication, Transportation	9 Entertainment and Recreation
4 Wholesale	X Public Administration
5 Retail	

A more detailed definition within these categories is given in Appendix B.

Overview of Truck Population

To generate a general profile of truck population in New York City, the data from the R. L. Polk and Company 10 percent Sample and the Tri-State Truck-Taxi Survey were processed,

collating truck characteristics in various combinations to provide matrix relationships. In the remaining part of this report, these sources will be referred to as "registration" and "survey" data, respectively. The results of these stratifications are presented and discussed in the paragraphs to follow.

Distribution of Trucks by Body and Fuel Type - From registration data, almost 85 percent of the total population is represented by 7 body types: van, pick-up, dump, panel, stake, body, tractor and compact van. Over 90 percent use gasoline engines. Predominant among the 9.7 percent of population which are diesel powered trucks are tractors which represent about 3.9 percent of the total. About 3.75 percent of diesels have van type bodies. Table 3 provides the distribution of 1971 registrations in the 9-county New York City area by body type and fuel type.

Distribution of Trucks by Body Type- The survey contained trucks over 6,000 pounds GVW but were not segregated by fuel type. If the truck population in the survey were separated by single unit and tractor trailer combinations, the numbers and distributions would be as shown in Table 4.

Registration data lists tractors without association to type of semi-trailer which it might be pulling. The survey indicates the combination and classifies that group by the type of tractor. Even though there was an 8-year span between registration data and survey data, a comparison between type of truck body contained in both sets was made after dropping out tractors and miscellaneous from the registration data. The classifications of body type and percent of the total 6,723 vehicles remaining is shown in Table 5.

In a similar vein, the survey data relating body styles of the 1047 trucks is also shown. This comparison indicates fair agreement when the time difference is considered. (Recall

Table 3

NINE COUNTY NEW YORK AREA
1971 MOTOR VEHICLE REGISTRATION
DISTRIBUTION OF TRUCKS BY BODY TYPE
AND FUEL TYPE

<u>BODY TYPE</u>	<u>GASOLINE PERCENT</u>	<u>DIESEL PERCENT</u>	<u>TOTAL PERCENT</u>
Compact Van	7.4	0	6.6
Dump	9.9	17.0	10.6
Flat-bed	3.6	3.1	3.6
Panel	9.9	2.6	9.1
Pickup	17.3	0	15.5
Refrigerator	1.5	2.2	1.6
Stake Body	9.7	1.4	8.9
Tank	3.1	12.9	4.1
Tractor	4.3	45.8	8.5
Van	27.0	14.6	25.7
Wrecker	2.7	0.4	2.5
Miscellaneous	<u>3.6</u>	<u>0.0</u>	<u>3.3</u>
	100.0	100.0	100.0
<u>SAMPLE SIZE</u>			
TOTAL CLASSIFIED	6,296	701	6,997
TOTAL UNKNOWN	508	33	541
TOTAL REGISTERED	6,804	734	7,538
<u>PERCENT OF TOTAL SAMPLE UNKNOWN</u>			
	7.5	4.5	7.2

* Miscellaneous includes buses, house cars, motor homes, van campers, station buses, wagons and other multipurpose vehicles.

SOURCE: R. L. Polk & Co.

Table 4

STRATIFICATION OF TRUCKS OVER 6,000 GW
BY
TYPE OF BODY FOR SU AND TT TRUCKS

<u>SINGLE UNIT TRUCKS</u>	<u>NUMBER OF TRUCKS</u>	<u>PER CENT OF TRUCKS</u>
Panel	39	4.1
Pick-up	6	0.6
Step-in Delivery	38	3.9
Tank	33	3.4
Van	484	50.3
Stake	109	11.3
Dump	79	8.2
Other	<u>175</u>	<u>18.2</u>
Subtotal	963	100.0
<u>TRACTOR TRAILOR TRUCKS</u>		
Van	46	54.8
Dump	5	5.9
Flat Bed	29	34.5
Other	<u>4</u>	<u>4.8</u>
Subtotal	84	100.0
TOTAL	1,047	

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

Table 5
COMPARISONS OF BODY TYPE
New York City Area

REGISTRATION DATA ⁽¹⁾			SURVEY DATA		
BODY TYPE DESCRIPTOR	NUMBER	% TOTAL	BODY TYPE DESCRIPTOR	NUMBER	% TOTAL
Compact Van	463	6.9	Step-In Delivery	38	3.6
Panel	638	9.5	Panel	39	3.7
Pick-Up	1,088	16.2	Pick-up	6	0.6
Van	1,805	26.8	Van	530	50.6
Tank Truck	288	4.2	Tank Truck	33	3.2
Stake Body	622	9.2	Stake Body	109	10.4
Flat Bed	251	3.7	Flat Bed	29	2.8
Dump	741	11.2	Dump	84	8.0
Wrecker	173	2.6			
Refrigerator	110	1.6			
			Other	179	17.1
Unknown	544	8.1			
	<u>6,723</u>	<u>100.0</u>		<u>1,047</u>	<u>100.0</u>

SOURCE:

- (1) R. L. Polk & Company 10 per cent sample of 1971 Registration Data - 9 County N.Y.C. Data - Permission for further use must be obtained from R. L. Polk & Co.
- (2) Tri-State Truck-Taxi Survey - 1963

that 1971 registrations were the earliest available for New York City). It dramatically illustrates the effect of interpretation of body type descriptors between two data sources. Generally good agreement was maintained between tank, stake, and dump trucks.

However, four descriptors appear to describe similar body styles. Registration data descriptors of compact-van, panel, pick-up, and van trucks could be describing the same grouping as collectively described by the survey data descriptors of step-in delivery, panel, pick-up and van, for each group respectively contain 59.4 percent and 58.5 percent of the total population. When comparisons are made between what appears to be the same body style within each aggregated group indicates large disagreement.

Another possible source of the disparity is that trucks registered in an area are not always used to a great extent in that area. The survey data indicates only trucks reporting qualified trips in the area.

The disparity between survey data and registration data is not important in the final analysis. Registration data was the principal source of distribution of fuel type among truck stratifications. With this exception, 1971 registration data were not employed except for comparative purposes.

Distribution of NYC Registrations by Fuel Type, Vehicle Type and GVW - The 1971 registration data for the nine-county area was sorted for fuel type, vehicle type and GVW. There were 4,464 vehicles in these records. The percent distribution of fuel type is shown in Table 6.

Table 6

PERCENT OF TOTAL NYC REGISTRATIONS
BY FUEL TYPE, VEHICLE TYPE, & GVW

GVW CLASS	V E H I C L E T Y P E					
	2-Axle		3-Axle		Tractor-Trailer	
	Diesel	Gasoline	Diesel	Gasoline	Diesel	Gasoline
10-14,000	0*	2.9	-	-	-	0.5
14-16,000	0.5	15.9	-	-	0*	1.5
16-19,500	0*	15.1	-	-	0.8	2.8
19.5-26,000	1.5	26.3	-	-	0.5	5.0
26-33,000	3.2	5.0	0*	-	2.5	1.9
33,000+	<u>1.0</u>	<u>1.7</u>	<u>2.4</u>	<u>2.0</u>	<u>3.4</u>	<u>3.1</u>
	7.2	66.9	2.4	2.0	7.2	14.8

0* Less than 0.1%.

- None in sample.

SOURCE: R. L. Polk & Co. - Permission for further use must be
obtained from R. L. Polk & Co.

With the 2-axle category, 91.3 percent of the total sample of 3,278 vehicles were gasoline powered. The 3-axle category was more equally divided, with 54.5 percent diesel and 45.5 gasoline powered out of a total of 200 vehicles in the sample. In the case of 995 tractor-trailer combinations, about one third were diesel; two thirds were gasoline.

Distributions of Trucks by Vehicle Type and GVW from Survey - The survey data yields what is considered a better profile of truck distributions by vehicle type and GVW, as shown in Table 7. Note that the 2-axle truck is still dominant with a total of 87.5 percent of all trucks in the survey in this class. The 3-axle category divides between single unit and combination, with 4.0 percent and 3.4 percent, respectively. Only 5.1 percent of all trucks in the survey were combinations with greater than 3 axles and "other".

Distribution of Trucks by County and Gross Vehicle Weight - The distribution of trucks registered by county and vehicle weight is indicated in Table 8. Of interest in this analysis is the observation that the distribution of trucks by weight in the Bronx is a good proxy candidate for total truck weight distribution in the 5 boroughs of New York City. The distribution of trucks weighing 10,000 pounds or less is concentrated primarily in the four counties of Nassau, Suffolk, Rockland and Westchester with 61.5 percent of this category there. Otherwise, heavier trucks are predominant in the New York City area with 53.0 to 54.8 percent of the trucks registered in these categories.

Table 7

NEW YORK CITY TRUCK POPULATION
BY GVW AND TYPE OF TRUCK

CATEGORY	2-AXLE TRUCK			3-AXLE TRUCK			TRACTOR TRAILER COMBINATION						GRAND TOTAL	
	Single Rear Tire		Total	Dual Rear Tire		Total	3-AXLE		4-AXLE		5-AXLE		OTHER	Total
	Number	Total		Number	Total		Number	Total	Number	Total	Number	Total	Number	Total
6-10,000	26	2.4	31	2.9	1	0.1	1	0.1	1	0.1			1	0.1
10-14,000	43	4.1	140	13.3					1	0.1				
14-16,000	19	1.8	87	8.3	3	0.3								
16-19,500	36	3.4	228	21.7	2	0.2	3	0.3	2	0.2			1	0.1
19.5-26,000	13	1.2	112	10.7	4	0.4	4	0.4						
26-33,000	11	1.0	88	8.3	3	0.3	7	0.7	2	0.2			1	0.1
Over 33,000	4	0.4	84	8.0	29	2.7	20	1.9	32	3.0	12	1.2		
TOTALS	152	14.3	770	73.2	42	4.0	35	3.4	38	3.6	12	1.2	3	0.3
														1,052
														100.0

SOURCE: 1963 Truck-Taxi Survey, Tri-State Regional Planning Commission.

Table 8

Nine-County New York Area
1971 MOTOR VEHICLE REGISTRATIONS
By County and Vehicle Weight

	WEIGHT								TOTAL	
	10,000 or less		10,001 - 19,500		19,501 - 26,000		Over 26,001			
	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent	Number	Per Cent
<u>New York City</u> Bronx	5,835	62.6 14.1	1,432	15.4 14.6	1,157	12.4 13.2	893	9.6 14.1	9,317	100.0 14.0
Kings	11,481	56.4 27.7	3,355	16.5 34.2	3,209	15.7 36.6	2,326	11.4 36.7	20,371	100.0 30.7
Queens	8,042	63.6 19.4	1,811	14.3 18.4	1,712	13.5 19.5	1,090	8.6 17.2	12,655	100.0 19.1
New York	13,161	65.6 31.8	2,790	13.9 28.4	2,425	12.1 27.7	1,691	8.4 26.7	20,067	100.0 30.3
Richmond	2,886	73.7 7.0	429	11.0 4.4	261	6.7 3.0	339	8.6 5.3	3,915	100.0 5.9
Subtotal	41,405	62.4 100.0	9,817	14.8 100.0	8,764	13.2 100.0	6,339	9.6 100.0	66,325	100.0 100.0
<u>New York Area</u> Nassau	20,399	70.5 19.0	3,377	11.7 18.2	2,949	10.2 18.5	2,219	7.6 18.5	26,944	100.0 18.7
Suffolk	27,192	80.4 25.3	2,819	8.3 15.2	2,272	6.7 14.2	1,572	4.6 13.1	34,855	100.0 22.0
Rockland	14,329	73.8 13.3	2,080	10.7 11.2	1,563	8.0 9.8	1,452	7.5 12.1	19,424	100.0 12.6
Westchester	4,153	76.9 3.9	437	8.1 2.4	427	7.9 2.7	384	7.1 3.2	5,401	100.0 3.5
TOTAL	107,478	69.8	18,530	12.0	15,975	10.4	11,966	7.8	133,949	100.0

SOURCE: R. L. Polk & Co.

Distribution of Truck Population by Fuel Type and Model Year - A little over 90 per cent of trucks registered in the 9-county area are gasoline powered. How the truck population is distributed by model year is shown in Table 9. Note that the percent of trucks registered in 1971 by model year that are diesel increased slightly over the norm for the 1967 to 1970 model years. This share reduced for 1971 models. Again, these are total truck registrations in the 9-county region. The indications are that these are principally over-the-road vehicles, for few large diesels operate in the congested New York City area except as through-trucks on selected routes.

Truck Ownership by Industry Type - The survey provides information on truck ownership for trucks in the New York City area. Almost 18 percent of the trucks are rented. Three categories of industries--Manufacturing, Utilities/Communications/Transportation, and Wholesale--operate about 76 percent of the trucks in the New York City area. Almost 20 percent of these vehicles are rented by these industries, with this practice more prevalent in Manufacturing and Wholesale industries than in the remaining category. Table 10 indicates this distribution.

Distribution of Trucks by Vehicle Type and Industry Type - The survey data also provides visibility into the types of vehicles operated by the 11 industry categories. About 72.5 percent of all vehicles operated are the 2-axle, dual-rear-tire type. Almost 87 percent are 2-axle vehicles. Of this group, almost 76 percent of the 2-axle vehicles are operated by the three categories of industries--Manufacturing, Utilities/Communications/Transportation, and Wholesale. Almost 60 percent of the 3-axle single unit trucks are operated by these industries. Table 11 presents this stratification for all industry categories and all vehicle types in the survey.

TABLE 9

NINE COUNTY NEW YORK CITY AREA

NUMBER OF VEHICLES REGISTERED BY MODEL YEAR AND FUEL TYPE
10% SAMPLE OF LAST 10 YEARS MODELS

1971

MODEL YEAR	TYPE FUEL						TOTAL
	DIESEL		GASOLINE		UNKNOWN		
	NUMBER	% OF TOTAL	NUMBER	% OF TOTAL	NUMBER	% OF TOTAL	
1962	33	6.6	466	93.4	6		499
1963	28	4.9	538	95.1			566
1964	59	9.7	602	90.3			667
1965	42	6.7	584	93.3			626
1966	68	8.7	714	91.2	1	0.1	783
1967	97	13.8	607	86.2	2	0.2	704
1968	84	10.9	684	89.1			768
1969	120	10.9	988	89.0			1,110
1970	131	12.0	964	88.0			1,095
1971	72	9.9	657	90.1			729
TOTAL	734	9.7	6,804	90.2	9	0.1	7,547

Data Source: R. L. Polk & Co. Permission for further use must be
obtained from R. L. Polk & Co.

TABLE 10
NEW YORK CITY DATA
 ANALYSIS OF TRUCK OWNERSHIP
 BY INDUSTRY TYPE

<u>BUSI/ INDUST</u>	<u>OWN</u>	<u>RENT</u>	<u>TOTAL</u>
- PUBLIC ADMINISTRATION	33	1	34
0 AGRICULTURAL	6	-	6
1 CONSTRUCTION	57	3	57
2 MANUFACTURING	164	57	221
3 UTIL., COMM., TRANS.	289	38	327
4 WHOLESALE	190	63	253
5 RETAIL	80	16	96
6 FINANCE	3	-	3
7 PROFESSIONAL	4	1	5
8 REPAIR	<u>38</u>	<u>8</u>	<u>46</u>
TOTAL	864	187	1,051
3	82.1%	17.9%	

SOURCE: 1963 Truck-Taxi Survey, Tri-State Regional Planning Commission

TABLE 11

NEW YORK CITY DATA

NUMBER OF TRUCKS OVER 6,000 POUND GVW
BY VEHICLE TYPE AND TYPE OF INDUSTRY

VEH TYPE	TYPE OF INDUSTRY										TOTAL
	0	1	2	3	4	5	6	7	8	9	
2 Axle - Single Rear Tires	1	7	26	49	41	12	2	1	10	3	152
2 Axle - Dual Rear Tires	5	39	174	214	194	76	1	4	32	27	766
3 Axle - Dual Rear Tires		11	7	10	8	3			1	2	42
3 Axle - Combination		1	8	19	4				3		35
4 Axle - Combination		1	3	26	4	3					37
5 Axle - Combination			1	9		2					12
Other		1									3
TOTAL	6	60	219	327	251	96	3	5	46	34	1047
PERCENT OF TOTAL	0.6	5.7	20.9	31.3	24.0	9.2	0.3	0.5	4.4	-	3.3

TYPE OF INDUSTRY CODE

0 - Agricultural	6 - Finance
1 - Construction	7 - Professional
2 - Manufacturing	8 - Repair
3 - Utility, Communication, Transportation	9 - Entertainment and Recreation
4 - Wholesale	X - Public Administration
5 - Retail	

Data Source: 1963 Truck-Taxi Survey, Tri-State Regional Planning Commission

Distribution of Single-Unit and Tractor-Trailer Combinations by Industry Type and GVW - Table 12 expands the distribution by GVW categories. Among the single-unit trucks, approximately 58 percent weigh between 6,000 and 19,500 pounds GVW. Of this percentage, 44 percent are operated by the three-industry group previously cited. A little over 8 percent of the vehicles in use are tractor-trailer combinations, with over 62.5 percent of all combinations being operated by the Utilities/Communications/Transportation category of industry. The three categories of industry operate about 86 percent of all combinations.

Fleet Size - An indication of truck fleet operations by type of industry can be gained from survey data in Table 13. Of all interviewees in the survey, about 80 percent of those reporting 51 or more trucks garaged at the same address were in the three-industry group. Manufacturers were the dominant industry within this group, reporting about 28 percent of their trucks were garaged with 50 or more trucks in the same place.

Correlation of GVW and Empty Weight - New York registers trucks by GVW. California registers them by empty weight. To examine these two parameters for possible correlation, a linear regression analysis using the least squares method was performed on the Tri-State truck data shown in Table 14. For each of the 1,047 trucks in the sample, the truck's GVW and EVW were introduced into a linear regression computer program. The program treated the GVW as the dependent variable and the EVW as the independent variable. The analysis results in linear equation:

$$GVW = 1.84 EVW + 856 \text{ lbs.}$$

The correlation coefficient for the analysis was 0.84, which lies in the poor to fair range. Given the truck's EVW, the equation predicts the GVW with approximately 70 percent confidence. Converting the EVW categories used in the Los Angeles data to GVW yields the following results:

TABLE 12

NEW YORK CITY DATA

DISTRIBUTION OF TRUCKS OVER 6,000 POUNDS GVM
By SINGLE UNIT/TRACTOR-TRAILER INDUSTRY TYPE AND GVM
CATEGORY

VEH BUSI/ TYPE INDUS	6,000 10,000	PERC/ TOTAL	10,001 14,000	PERC/ TOTAL	14,001 16,000	PERC/ TOTAL	16,001 19,500	PERC/ TOTAL	19,501 26,000	PERC/ TOTAL	26,001 33,000	PERC/ TOTAL	33,001 AND UP	PERC/ TOTAL
2	12	1.14	59	3.72	26	2.48	55	5.24	35	3.34	26	2.48	15	1.43
3	5	.48	42	4.00	33	3.15	89	8.48	46	4.37	28	2.67	30	2.86
4	16	1.53	43	4.10	30	2.86	73	6.96	31	2.96	24	2.29	28	2.67
5	6	.57	22	2.10	8	.76	19	1.81	7	.67	6	.57	23	2.19
9	18	1.72	37	3.53	12	1.14	30	2.86	10	.95	18	1.72	21	2.00
Subtotal	57	5.43	183	17.45	109	10.39	266	25.36	129	12.30	102	9.72	117	11.15
2														
3	1	.10	1	.10			5	.48	4	.38	3	.29	9	.86
4														
5														
9														
Subtotal	1	.10	1	.10			1	.10	4	.38	2	.19	5	.48
TOTAL	58	5.53	184	17.54	109	10.39	272	25.93	133	12.68	112	10.68	121	11.25

INDUSTRY CODE

- 2 - Manufacturing
- 3 - Utility, Communications and Transportation
- 4 - Wholesale
- 5 - Retail
- 9 - All Other

Data Source: 1963 Truck-Taxi Survey, Tri-State Regional Planning Commission

TABLE 13

NEW YORK CITY DATA

TRUCK OPERATORS REPORTING NUMBER OF TRUCKS

GARAGED AT SAME ADDRESS

By INDUSTRY TYPE

BUSINESS/INDUSTRY	0-1	N.J. 2-4	NUMBER OF TRUCKS					GARAGED AT SAME ADDRESS				AT SAME ADDRESS				TOTAL
			5-10	10-25	26-50	51-100	101-200	201-500	500-UP	101-200	201-500	500-UP				
0 - Public Administration	1	1	4	6	2	6	8	3						31		
0 - Agriculture	1	5	2	5		5	1							6		
1 - Construction	10	22	10	26	26	25	19	14						54		
2 - Manufacturing	24	40	34	50	33	28	16	15	2					208		
3 - Utilities, Communication and Transportation	34	79	65	39	16	16	3	2						322		
4 - Wholesale and Retail Trade	35	78	47	15	6	3	1	1						236		
5 - Government	15	34	15	15										90		
6 - Other			1	1										1		
7 - Other			1	3										1		
8 - Other	3	8	9	7	4	2	3	3						4		
TOTAL	123	206	188	151	87	35	51	38	2					991		

BUSINESS/INDUSTRY CODE

0 - Public Administration

0 - Agriculture

1 - Construction

2 - Manufacturing

3 - Utilities, Communication and Transportation

4 - Wholesale

5 - Retail

6 - Finance

7 - Professional

8 - Repair

9 - Entertainment and Recreation

SOURCE: 1963 Truck-Taxi Survey, Tri-State Regional Planning Commission

NEW YORK CITY DATA
CORRELATION STUDY BETWEEN GROSS VEHICLE
WEIGHT AND EMPTY WEIGHT OF
TRUCKS

GW	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034	2035	2036	2037	2038	2039	2040	2041	2042	2043	2044	2045	2046	2047	2048	2049	2050	2051	2052	2053	2054	2055	2056	2057	2058	2059	2060	2061	2062	2063	2064	2065	2066	2067	2068	2069	2070	2071	2072	2073	2074	2075	2076	2077	2078	2079	2080	2081	2082	2083	2084	2085	2086	2087	2088	2089	2090	2091	2092	2093	2094	2095	2096	2097	2098	2099	2100	2101	2102	2103	2104	2105	2106	2107	2108	2109	2110	2111	2112	2113	2114	2115	2116	2117	2118	2119	2120	2121	2122	2123	2124	2125	2126	2127	2128	2129	2130	2131	2132	2133	2134	2135	2136	2137	2138	2139	2140	2141	2142	2143	2144	2145	2146	2147	2148	2149	2150	2151	2152	2153	2154	2155	2156	2157	2158	2159	2160	2161	2162	2163	2164	2165	2166	2167	2168	2169	2170	2171	2172	2173	2174	2175	2176	2177	2178	2179	2180	2181	2182	2183	2184	2185	2186	2187	2188	2189	2190	2191	2192	2193	2194	2195	2196	2197	2198	2199	2200	2201	2202	2203	2204	2205	2206	2207	2208	2209	2210	2211	2212	2213	2214	2215	2216	2217	2218	2219	2220	2221	2222	2223	2224	2225	2226	2227	2228	2229	2230	2231	2232	2233	2234	2235	2236	2237	2238	2239	2240	2241	2242	2243	2244	2245	2246	2247	2248	2249	2250	2251	2252	2253	2254	2255	2256	2257	2258	2259	2260	2261	2262	2263	2264	2265	2266	2267	2268	2269	2270	2271	2272	2273	2274	2275	2276	2277	2278	2279	2280	2281	2282	2283	2284	2285	2286	2287	2288	2289	2290	2291	2292	2293	2294	2295	2296	2297	2298	2299	2300	2301	2302	2303	2304	2305	2306	2307	2308	2309	2310	2311	2312	2313	2314	2315	2316	2317	2318	2319	2320	2321	2322	2323	2324	2325	2326	2327	2328	2329	2330	2331	2332	2333	2334	2335	2336	2337	2338	2339	2340	2341	2342	2343	2344	2345	2346	2347	2348	2349	2350	2351	2352	2353	2354	2355	2356	2357	2358	2359	2360	2361	2362	2363	2364	2365	2366	2367	2368	2369	2370	2371	2372	2373	2374	2375	2376	2377	2378	2379	2380	2381	2382	2383	2384	2385	2386	2387	2388	2389	2390	2391	2392	2393	2394	2395	2396	2397	2398	2399	2400	2401	2402	2403	2404	2405	2406	2407	2408	2409	2410	2411	2412	2413	2414	2415	2416	2417	2418	2419	2420	2421	2422	2423	2424	2425	2426	2427	2428	2429	2430	2431	2432	2433	2434	2435	2436	2437	2438	2439	2440	2441	2442	2443	2444	2445	2446	2447	2448	2449	2450	2451	2452	2453	2454	2455	2456	2457	2458	2459	2460	2461	2462	2463	2464	2465	2466	2467	2468	2469	2470	2471	2472	2473	2474	2475	2476	2477	2478	2479	2480	2481	2482	2483	2484	2485	2486	2487	2488	2489	2490	2491	2492	2493	2494	2495	2496	2497	2498	2499	2500	2501	2502	2503	2504	2505	2506	2507	2508	2509	2510	2511	2512	2513	2514	2515	2516	2517	2518	2519	2520	2521	2522	2523	2524	2525	2526	2527	2528	2529	2530	2531	2532	2533	2534	2535	2536	2537	2538	2539	2540	2541	2542	2543	2544	2545	2546	2547	2548	2549	2550	2551	2552	2553	2554	2555	2556	2557	2558	2559	2560	2561	2562	2563	2564	2565	2566	2567	2568	2569	2570	2571	2572	2573	2574	2575	2576	2577	2578	2579	2580	2581	2582	2583	2584	2585	2586	2587	2588	2589	2590	2591	2592	2593	2594	2595	2596	2597	2598	2599	2600	2601	2602	2603	2604	2605	2606	2607	2608	2609	2610	2611	2612	2613	2614	2615	2616	2617	2618	2619	2620	2621	2622	2623	2624	2625	2626	2627	2628	2629	2630	2631	2632	2633	2634	2635	2636	2637	2638	2639	2640	2641	2642	2643	2644	2645	2646	2647	2648	2649	2650	2651	2652	2653	2654	2655	2656	2657	2658	2659	2660	2661	2662	2663	2664	2665	2666	2667	2668	2669	2670	2671	2672	2673	2674	2675	2676	2677	2678	2679	2680	2681	2682	2683	2684	2685	2686	2687	2688	2689	2690	2691	2692	2693	2694	2695	2696	2697	2698	2699	2700	2701	2702	2703	2704	2705	2706	2707	2708	2709	2710	2711	2712	2713	2714	2715	2716	2717	2718	2719	2720	2721	2722	2723	2724	2725	2726	2727	2728	2729	2730	2731	2732	2733	2734	2735	2736	2737	2738	2739	2740	2741	2742	2743	2744	2745	2746	2747	2748	2749	2750	2751	2752	2753	2754	2755	2756	2757	2758	2759	2760	2761	2762	2763	2764	2765	2766	2767	2768	2769	2770	2771	2772	2773	2774	2775	2776	2777	2778	2779	2780	2781	2782	2783	2784	2785	2786	2787	2788	2789	2790	2791	2792	2793	2794	2795	2796	2797	2798	2799	2800	2801	2802	2803	2804	2805	2806	2807	2808	2809	2810	2811	2812	2813	2814	2815	2816	2817	2818	2819	2820	2821	2822	2823	2824	2825	2826	2827	2828	2829	2830	2831	2832	2833	2834	2835	2836	2837	2838	2839	2840	2841	2842	2843	2844	2845	2846	2847	2848	2849	2850	2851	2852	2853	2854	2855	2856	2857	2858	2859	2860	2861	2862	2863	2864	2865	2866	2867	2868	2869	2870	2871	2872	2873	2874	2875	2876	2877	2878	2879	2880	2881	2882	2883	2884	2885	2886	2887	2888	2889	2890	2891	2892	2893	2894	2895	2896	2897	2898	2899	2900	2901	2902	2903	2904	2905	2906	2907	2908	2909	2910	2911	2912	2913	2914	2915	2916	2917	2918	2919	2920	2921	2922	2923	2924	2925	2926	2927	2928	2929	2930	2931	2932	2933	2934	2935	2936	2937	2938	2939	2940	2941	2942	2943	2944	2945	2946	2947	2948	2949	2950	2951	2952	2953	2954	2955	2956	2957	2958	2959	2960	2961	2962	2963	2964	2965	2966	2967	2968	2969	2970	2971	2972	2973	2974	2975	2976	2977	2978	2979	2980	2981	2982	2983	2984	2985	2986	2987	2988	2989	2990	2991	2992	2993	2994	2995	2996	2997	2998	2999	3000	3001	3002	3003	3004	3005	3006	3007	3008	3009	3010	3011	3012	3013	3014	3015	3016	3017	3018	3019	3020	3021	3022	3023	3024	3025	3026	3027	3028	3029	3030	3031	3032	3033	3034	3035	3036	3037	3038	3039	3040	3041	3042	3043	3044	3045	3046	3047	3048	3049	3050	3051	3052	3053	3054	3055	3056	3057	3058	3059	3060	3061	3062	3063	3064	3065	3066	3067	3068	3069	3070	3071	3072	3073	3074	3075	3076	3077	3078	3079	3080	3081	3082	3083	3084	3085	3086	3087	3088	3089	3090	3091	3092	3093	3094	3095	3096	3097	3098	3099	3100	3101	3102	3103	3104	3105	3106	3107	3108	3109	3110	3111	3112	3113	3114	3115	3116	3117	3118	3119	3120	3121	3122	3123	3124	3125	3126	3127	3128	3129	3130	3131	3132	3133	3134	3135	3136	3137	3138	3139	3140	3141	3142	3143	3144	3145	3146	3147	3148	3149	3150	3151	3152	3153	3154	3155	3156	3157	3158	3159	3160	3161	3162	3163	3164	3165	3166	3167	3168	3169	3170	3171	3172	3173	3174	3175	3176	3177	3178	3179	3180	3181	3182	3183	3184	3185	3186	3187	3188	3189	3190	3191	3192	3193	3194	3195	3196	3197	3198	3199	3200	3201	3202	3203	3204	3205	3206	3207	3208	3209	3210	3211	3212	3213	3214	3215	3216	3217	3218	3219	3220	3221	3222	3223	3224	3225	3226	3227	3228	3229	3230	3231	3232	3233	3234	3235	3236	3237	3238	3239	3240	3241	3242	3243	3244	3245	3246	3247	3248	3249	3250	3251	3252	3253	3254	3255	3256	3257	3258	3259	3260	3261	3262	3263	3264	3265	3266	3267	3268	3269	3270	3271	3272	3273	3274	3275	3276	3277	3278	3279	3280	3281	3282	3283	3284	3285	3286	3287	3288	3289	3290	3291	3292	3293	3294	3295	3296	3297	3298	3299	3300	3301	3302	3303	3304	3305	3306	3307	3308	3309	3310	3311	3312	3313	3314	3315	3316	3317	3318	3319	3320	3321	3322	3323	3324	3325	3326	3327	3328	3329	3330	3331	3332	3333	3334	3335	3336	3337	3338	3339	3340	3341	3342	3343	3344	3345	3346	3347	3348	3349	3350	3351	3352	3353	3354	3355	3356	3357	3358	3359	3360	3361	3362	3363	3364	3365	3366	3367	3368	3369	3370	3371	3372	3373	3374
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<u>L. A. EVW Categories</u>	<u>Equivalent GVW Categories</u>
6,000 - 9,999	11,856 - 19,256
10,000 - 14,999	19,256 - 28,456
15,000 - 19,999	28,456 - 37,756
20,000 - 24,999	37,756 - 46,856
25,000 - 29,999	46,856 - 56,056
30,000 - 34,999	56,056 - 65,256
35,000 +	65,256 +

The confidence in this predictive model was so low that it was rejected as a means to correlate the Los Angeles data to GVW.

Omission of Certain Vehicles in Data

Certain vehicle types are not included in these data. Representative of this class are the recreational vehicles such as camper/pick-up combinations, motor homes, etc. There were no vehicles of this type appearing in the Tri-State survey data, apparently due to the small number in the total population. They are also not considered by owners and others as "trucks" in their use patterns. The omission is not considered significant since only the very largest and more luxurious motor homes exceed 10,000 pounds GVW. Annual production of this type vehicle is less than 100,000.

Chapter 4

PATTERNS OF TRUCK USAGE

From a study and analysis of the survey trip data, it was possible to generate an understanding of the patterns of truck usage. These survey data had already been processed to contain only truck data which made a "qualified" trip within New York City. A "qualified" trip was one which had either origin, destination or both within the city limits during the survey period. Number of trips, county of origin, county of destination, airline trip mileage, elapsed trip time and other trip information was contained in these data. Various correlation studies were run to obtain a pattern of usage.

The definition of an internal-external trip was given to a trip which had exclusively an origin or destination within the city. An internal-internal trip was one in which both had origin and destination within the city.

Number of Trips by Industry Type and Vehicle Type

The Truck-Taxi Survey contained data on a total of 11,283 trips performed during the survey period which were "qualified". The manner in which these trips distribute among 4 industry groups by vehicle type is shown in Table 15. This table is a compression of a more extensive stratification, given in Table C-1 in Appendix C. The category of "all other" includes 7 industry types, when combined, forms a group of comparable size to Manufacturing, Utility/Communications/Transportation, and Wholesale industries, with the share of total trips being 21.6, 25.8, 27.4, and 25.2 percent respectively. These data pertain to vehicles with GVW greater than 6000 pounds.

Table 15

NEW YORK CITY DATA

NUMBER OF REPORTED TRIPS
BY INDUSTRY TYPE AND VEHICLE TYPE
FOR ALL VEHICLES OVER 6000 POUND GVW

VEHICLE TYPE	SINGLE UNIT TRUCKS			TRACTOR-TRAILER COMBINATIONS				TOTAL
	2-AXLE SINGLE REAR TIRE	2-AXLE DUAL REAR TIRE	3-AXLE DUAL REAR TIRE	3-AXLE	4-AXLE	5-AXLE	OTHER	
Manufacturing	514	2310	38	33	13	2		2910
Utility/Commu- nications/ Transportation	527	2293	72	78	88	29		3087
Wholesale	396	2393	69	19	11			2853
All Other	418	1797	156	18	18	19	7	2433
Total	1855	8758	335	148	130	50	7	11283

SOURCE: 1963 TRUCK-TAXI SURVEY, Tri-State
Regional Planning Commission

Approximately 78 percent of all trips were reported by operators of the single unit, 2-axle, dual-rear-tire trucks. The single unit, 2-axle, single-rear-tire trucks had about a 16.5 percent share, so that the combined grouping accounts for about 94.5 percent of all trips. Approximately 3 percent of total trips were reported for the 3-axle, dual-rear-tire trucks. Therefore, the single unit trucks in the area perform almost 97.5 percent of trips. The remainder are assigned to all types of tractor-trailer combinations.

About 25.7 percent of the travel is performed by trucks who made 17 or more daily trips, as shown in Table 16. Predominant in this grouping is the 2-axle, dual-rear-tire truck. The single unit, 2-axle trucks performed almost all trips in this category.

At the other end of the scale, 92 percent of all tractor-trailer combinations and "other" vehicle types performed between 1 and 6 daily trips.

Trip Characteristics by Vehicle Type

The survey data recorded trip distance by airline mileage between planning network nodes. The relationships between number of trips performed and the mileage were associated with both the vehicle type and the vehicle GVW. These were stratified by internal-internal and internal-external type trips.

Trips and Mileage by Vehicle Type - Table 17 presents a summary of these data by vehicles over 6000 pounds GVW. The 2-axle, dual-rear-tire truck dominates in both generating about 77.7 percent of the total trips and 70.5 percent of total airline survey miles. This travel is divided between internal-internal trips, which accounted for 60 percent of the total number of trips and about 47.1 percent of the total airline mileage. Another 23.4 percent of total trip mileage was traveled in performing internal-external trips. Table 18 summarizes the average trip

Table 16

NUMBER OF DAILY TRIPS REPORTED
BY VEHICLE-TYPE AND INDUSTRY TYPE
FOR TRUCKS OVER 6,000 POUNDS GVW

New York City Data

VEHICLE TYPE		NUMBER OF TRUCK-TRIPS REPORTED											TOTAL
INDUSTRY TYPE		1-2	3-4	5-6	7-8	9-10	11-12	13-14	15-16	17+			
2-Axle Single Rear Tires	Manufacturing	52	45	40	37	34	30	28	26	222	514		
	Utility/Communications/Transport	98	89	74	65	52	45	31	25	48	527		
	Wholesale	82	63	50	40	31	28	20	16	66	396		
	All Other Industry Types	71	45	39	29	19	14	12	10	179	418		
	Subtotals	303	242	203	171	136	117	91	77	515	1,855		
2-Axle Dual Rear Tires	Manufacturing	345	288	247	204	174	144	125	115	688	2,310		
	Utility/Communications/Transport	425	333	243	181	147	130	110	93	631	2,293		
	Wholesale	386	307	248	210	193	167	145	129	573	2,358		
	All Other Industry Types	362	262	196	150	126	102	78	59	462	1,797		
	Subtotals	1,518	1,190	934	745	640	543	458	396	2,334	8,758		
3-Axle Dual Rear Tires	Manufacturing	14	13	6	3	2	4	2	2	18	38		
	Utility/Communications/Transport	20	12	6	4	4	6	2	2	3	72		
	Wholesale	16	13	12	9	6	6	2	2	24	69		
	All Other Industry Types	33	22	18	16	15	12	9	7	24	156		
	Subtotals	83	60	42	32	27	22	13	11	45	335		
3-Axle Tractor-Trailer Combinations	Manufacturing	16	8	5	2	1	2	2	2	33	33		
	Utility/Communications/Transport	38	23	8	3	2	2	2	2	78	78		
	Wholesale	8	7	4	4	1	—	—	—	19	19		
	All Other Industry Types	8	5	4	1	—	—	—	—	18	18		
	Subtotals	70	43	22	6	3	2	2	2	148	148		
5-Axle T-T Combinations	Manufacturing	2	7	4	—	—	—	—	—	2	2		
	Utility/Communications/Transport	18	2	2	2	2	2	2	2	29	29		
	All Other (No Wholesale)	4	—	—	—	—	—	—	—	1	1		
	Subtotals	24	9	6	2	2	2	2	2	50	50		
	Agricultural	4	2	1	—	—	—	—	—	7	7		
Other Types													
GRAND TOTALS		2,075	1,589	1,219	959	808	686	566	486	2,896	11,283		

SOURCE: 1963 Truck-Taxi Survey, Tri-State Regional Planning Commission.

Table 17

NEW YORK CITY DATA

Trip Characteristics By Vehicle Type Over 6,000 Pounds GVW

VEHICLE TYPE	INTERNAL - INTERNAL			INTERNAL - EXTERNAL			TOTAL		
	Number Trips	Total Airline Miles		Number Trips	Total Airline Mileage		Number Trips	Total Airline Mileage	
1. 2-Axle, single rear tire	1,784	2,175		71	1,042		1,855	3,217	
2. 2-Axle, dual rear tire	8,371	12,097		412	6,019		8,783	18,116	
3. 3-Axle, dual rear tire	309	786		26	372		335	1,158	
4. 3-Axle, T.-T. Combination	94	332		54	1,406		148	1,738	
5. 4-Axle, T.-T. Combination	65	242		65	824		130	1,066	
6. 5-Axle, T.-T. Combination	36	98		14	350		50	448	
7. Other	6	15		1	13		7	28	
	10,665	15,745		643	10,026		11,308	25,771	

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

Table 18

NEW YORK CITY DATA

AVERAGE AIRLINE MILES AND PER CENT OF TOTAL INTERNAL-INTERNAL AND INTERNAL-EXTERNAL TRIPS
By Vehicle Type

VEHICLE TYPE	Internal - Internal Trip		Internal - External Trip	
	Average Airline Miles Per Trip	Per Cent Total Miles (Int.-Int.)	Average Airline Miles Per Trip	Per Cent Total Miles (Int-Ext.)
1. 2-axle, single rear tire	1.21	13.8	14.67	10.4
2. 2-axle, dual rear tire	1.44	76.7	14.60	60.0
3. 3-axle, dual rear tire	2.53	5.0	14.26	3.7
4. 3-axle, combination	3.52	2.1	26.04	14.1
5. 4-axle, Combination	3.72	1.5	12.67	8.2
6. 5-axle, combination	2.73	0.6	24.92	3.5
7. Other	2.49	0.1	13.38	0.1

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

airline miles and the percentage of total miles traveled by types of vehicles in performing internal-internal and internal-external trips.

The distribution of airline trip distance by vehicle type for the two trip types is shown in Table 19.

Travel distance in a rectangular network can be estimated from airline distance by multiplying the later by the factor 1.21.

Trip Elapsed Time by Vehicle Type - Survey trip data included estimated elapsed time for each reported trip. These times have been organized by vehicle type for all vehicles over 6000 pounds GVW, in Table 20. Shown here are the elapsed trip time increment distributions for internal-internal and internal-external type trips. Standing alone, these data have little meaning except to provide a rough travel time estimate by vehicle type. However, when associated with each trip distance, a more accurate estimate of average speed can be made. Association with trip end and trip start times of contiguous trips provides the ability to estimate soak-time of engines. These will be discussed later in this chapter.

Travel Characteristics of Trucks over 6000 Pounds GVW - A summary of travel characteristics of trucks over 6000 pounds GVW is presented in Table 21. Once again, the 2-axle, dual-rear-tire truck is shown to generate about 70 percent of the total truck vehicle traveled (VMT). All single unit trucks account for 87.3 percent of the truck VMT. The average speed for single unit trucks was approximately 8.5 mph. Combinations averaged the high speed of 13.7 mph, due, most likely to the fact that little travel was performed on narrow, congested local streets.

The 2-axle, single-rear-tire truck averaged more daily trips while the 3-axle, dual-rear-tire truck had the lowest number of daily trips of the single unit truck category.

Table 19

NUMBER OF TRIPS AND AIRLINE MILEAGE OF
TRUCK-TRIPS FOR TRUCKS OVER 6,000 POUNDS GVM
BY VEHICLE TYPE

New York City Data

VEHICLE TYPE	INTERNAL-INTERNAL TRIPS												TOTAL TRIPS	TOTAL MILES
	A I R L I N E			D I S T A N C E										
	0-0.5	0.5-1	1.1-1.5	1.6-2	3-4	5-6	7-8	9-10	11-12	13-15	16-Up			
1	1,019	245	126	189	105	49	29	15	3	1	3	1,784	2,174.87	
2	4,488	1,068	608	930	661	305	157	86	36	18	14	8,371	12,097.07	
3	53	34	38	79	68	25	7	2	3			309	784.60	
4	27	11	4	6	20	18	2	2		2	2	94	331.84	
5	6	5	1	9	30	9	5					65	241.87	
6	11	1	4	5	7	8						36	98.27	
7	2		1	1	1	1						6	14.94	
TOTAL	5,600	1,364	782	1,219	892	415	200	105	42	21	19	10,665	15,743.46	

VEHICLE TYPE	INTERNAL-EXTERNAL TRIPS								TOTAL TRIPS	TOTAL MILES
	0-2	3-4	5-6	7-8	9-10	11-12	13-15	16-UP		
1	4	10	8	3	7	8	5	26	71	1,042.41
2	33	43	41	49	40	27	34	145	412	6,018.56
3	4	3		4			1	14	26	371.86
4	1		3	4	7	2	4	33	54	1,406.37
5	10	5	1	6	13	3	3	24	65	824.37
6	1	2		1	2	2	2	4	14	349.81
7							1		1	13.38
TOTAL	53	63	53	67	69	42	50	246	643	10,026.76
% OF TOTAL	8.2	9.8	8.2	10.4	10.7	6.5	7.8	38.3		

VEHICLE CODE:

1. 2-axle, single rear tire
2. 2-axle, dual rear tire
3. 3-axle, dual rear tire
4. 3-axle, tractor-trailer combination
5. 4-axle, tractor-trailer combination
6. 5-axle, tractor-trailer combination
7. Other

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

TABLE 20

NEW YORK CITY DATA

TRIP ELAPSED TIME IN MINUTES FOR TRUCKS
OVER 6,000 POUNDS GVW BY VEHICLE TYPE

TABLE 3A

INTERNAL-INTERNAL TRIPS ONLY
TRIP ELAPSED TIME-MINUTES

VEH TYPE	0-5	6-10	11-15	16-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-UP	TOTAL
1	694	549	470	170	170	43	36	51	4	7	12	13	7	1784
2	3473	1575	1575	890	890	179	232	197	23	40	37	40	46	8371
3	17	46	73	60	60	10	15	15	2	7	2	2	4	309
4	3	1	19	20	20	3	5	21	3	1	2	2	1	94
5	3	2	6	20	20	2	15	11	1	1	4	4	2	65
6	2	6	6	11	11	2	4	4	1	1	1	1	2	36
7	1	5	5	1	1	1	1	1	1	1	1	1	1	6
TOTAL	1172	1172	1172	245	245	302	302	300	33	56	55	59	60	10665
% OF TOTAL	40.3	19.6	19.3	11.0	2.3	2.8	2.8	2.8	0.3	0.5	0.6	0.6	0.6	1008

TABLE 3B

INTERNAL-EXTERNAL OF EXTERNAL-INTERNAL TRIPS
TRIP ELAPSED TIME-MINUTES

VEH TYPE	0-10	11-20	21-30	31-40	41-50	51-60	61-70	71-80	81-90	91-100	101-UP	TOTAL
1	3	13	13	3	6	13	3	3	5	2	8	71
2	14	20	79	37	40	47	19	30	50	7	31	412
3	2	2	2	2	2	8	1	1	1	2	2	26
4	2	2	2	1	5	8	2	6	16	2	13	54
5	1	2	7	4	5	22	6	6	5	7	7	65
6	1	6	1	1	1	6	1	3	3	2	2	14
7	1	1	1	1	1	1	1	1	1	1	1	1
TOTAL	20	45	97	47	60	155	31	39	80	17	63	643
% OF TOTAL	3.1	7.0	14.3	7.3	9.3	24.2	4.8	6.1	12.4	1.7	9.8	1008

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

TABLE 21
NEW YORK CITY DATA

SUMMARY OF URBAN TRUCK
TRAVEL CHARACTERISTICS BY VEHICLE TYPE
ALL TRUCKS OVER 6,000 POUNDS GVW

	<u>TYPE OF VEHICLE</u>								
	<u>1</u>	<u>2</u>	<u>3</u>	<u>SU</u>	<u>4</u>	<u>5</u>	<u>6</u>	<u>7</u>	<u>TT</u>
<u>VEHICLE MILES</u>									
% Int.-Int.	13.8	76.8	5.0	95.6	2.1	1.5	0.6	0.1	4.3
% Int.-Ext.	10.4	60.0	3.7	74.1	14.1	8.2	3.5	0.1	25.9
% OF TOTAL	12.5	70.3	4.5	87.3	6.7	4.0	1.7	0.1	12.5
<u>TRUCK TRIPS</u>									
% OF TOTAL	16.5	77.5	3.0	97.0	1.3	1.2	0.4	0.1	3.0
<u>TRUCK POPULATION</u>									
% OF TOTAL									
<u>TRI-STATE SURVEY</u>									
	14.5	73.3	4.0	91.8	3.3	3.5	1.1	0.3	8.2
<u>AVG. MILES PER TRIP</u>									
(MILES)	2.1	2.5	4.2	2.4	14.2	9.9	10.8	5.3	11.6
<u>AVG. MILES PER TRUCK</u>									
(MILES)	25.6	28.5	33.8	27.8	60.1	34.9	45.2	15.9	45.8
<u>AVG. TRIP SPEED</u>									
(MPH)	7.6	8.7	9.5	8.5	15.7	11.2	16.3	8.7	13.7
<u>AVG. NUMBER TRIPS PER TRUCK PER DAY</u>									
	12.2	11.4	8.1	11.4	4.2	3.5	4.2	3.0	3.9

Trips by combinations averaged almost five times longer than the single unit truck category but there were almost three-fourths fewer average daily trips.

A statistical analysis of trip characteristics was conducted to compare the aggregations of trucks above 6,000 pounds GVW and the aggregation above 10,000 pounds GVW. Table 22 indicates the results of these analyses. Eliminating the trucks between 6,000 and 10,000 pounds GVW affected the trip characteristics of only the 2-axle, single-rear-tire truck. The average number of daily trips for this truck type decreased for the higher weight aggregation and the number of miles per day tended to increase. Otherwise, the characteristics of the two aggregations remained the same.

The average daily hot soak time ranged from a little over 55 minutes to about 93 minutes for vehicles with GVW of 10,000 pounds and over as shown in Table 22. The number of trips in which the soak time exceeded 90 minutes is shown in the last column of this tabulation.

Trip Types for Trucks Over 10,000 Pounds GVW - An analysis of truck trips of this aggregation was performed. As shown in Table 23, internal-internal trips in all 5 boroughs were mostly performed by the single unit truck, accounting for over 98 percent of all trips of this nature. There were variations in the distribution of these trips among each of the boroughs. Much higher percentage of use of the 2-axle, dual-rear-tire truck was reported in Brooklyn and a lower than average use in Manhattan. In Manhattan, there was a significant increase in share of internal-internal travel by the smaller 2-axle, single-rear-tire truck.

One trend is worthy of note. No trips were reported by combinations in Richmond in the 1963 survey. The survey was conducted prior to the opening of the Verrazano Narrows Bridge and the resulting development and change in traffic patterns this facility has caused. It could be reasonable that the share of total internal-internal truck trips might approach that of other boroughs.

Table 22

NEW YORK CITY DATA
STATISTICAL ANALYSIS OF TRIP
CHARACTERISTICS BY VEHICLE TYPE

V. N.	TRIPS PER DAY		NO. MILES PER TRIP		NO. MILES PER TRUCK		SPEED(MPH)		DAILY SOAK-TIME PER TRUCK		NO. TRIPS > 90 MIN. SOAK TIME
	AVG.	DEV.	AVG.	DEV.	AVG.	DEV.	AVG.	DEV.	AVG.	DEV.	
VEHICLES OVER 10,000 POUNDS GVM											
1	11.6	04.0	04.4	03.0	26.4	20.4	07.7	09.6	78.2	60.4	73
2	11.4	14.2	02.5	10.2	24.5	24.0	08.5	07.0	62.1	62.8	415
3	01.1	07.6	04.2	07.8	33.3	29.2	09.5	14.8	55.4	87.2	28
4	04.2	01.6	14.2	28.4	59.9	74.3	15.8	10.9	92.8	98.7	37
5	02.5	01.6	09.9	08.6	34.9	34.7	11.2	06.2	51.2	59.0	35
6	04.0	04.3	10.8	15.3	45.2	74.1	16.3	11.2	57.5	84.0	12
7	03.0	02.8	05.3	11.1	15.9	00.4	08.7	08.0	72.5	02.5	
VEHICLES OVER 6,000 POUNDS GVM											
1	12.2	13.6	02.1	08.2	25.6	20.1	07.6	09.4	67.7	63.1	84
2	11.4	14.2	02.5	10.0	28.5	24.0	08.7	07.0	61.6	62.8	431
3	08.1	07.6	04.2	07.8	33.8	29.2	09.5	18.8	55.4	87.2	28
4	04.2	02.5	14.2	28.4	60.1	74.2	15.7	11.0	92.8	98.7	38
5	03.5	01.6	09.9	08.6	34.9	34.7	11.2	06.2	51.2	59.0	35
6	04.2	04.3	10.8	15.3	45.2	74.1	16.3	11.2	57.5	84.0	12
7	03.0	02.8	05.3	11.1	15.9	00.4	08.7	08.0	72.5	02.5	

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

TABLE 23

NEW YORK CITY DATA

STATISTICAL ANALYSIS OF TRIP CHARACTERISTICS
OF INTERNAL TRUCK-TRIPS BY VEHICLE TYPE
FOR TRUCKS OVER 10,000 POUNDS GVW

<u>BOROUGH</u>	<u>1</u>	<u>2</u>	<u>3</u>	<u>VEHICLE TYPE</u>				<u>TT</u>	<u>% OF TOTAL INTERNAL TRIPS</u>
				<u>SU</u>	<u>4</u>	<u>5</u>	<u>6</u>		
<u>BRONX</u>									10.7
% OF INTERNAL BRONX TRIPS	17.6	80.4	0.6	98.6	1.1	0.3	-	1.4	
<u>BROOKLYN</u>									32.0
% OF INTERNAL BROOKLYN TRIPS	6.6	89.9	1.9	98.4	0.9	0.4	0.3	1.6	
<u>MANHATTAN</u>									39.8
% OF INTERNAL MANHATTAN TRIPS	28.4	69.1	1.4	98.9	0.5	0.2	0.4	1.1	
<u>QUEENS</u>									15.9
% OF INTERNAL QUEENS TRIPS	12.6	81.0	4.6	98.2	0.4	0.9	0.5	1.8	
<u>RICHMOND</u>									1.6
% OF INTERNAL RICHMOND TRIPS	14.9	83.6	1.5	100.0	-	-	-	-	
TOTAL INTERNAL TRIPS	17.6	79.1	2.0	98.7	0.6	0.4	0.3	1.3	100.0

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

TABLE 24
NEW YORK CITY DATA

STATISTICAL ANALYSIS OF TRIP CHARACTERISTICS
OF EXTERNAL TRUCK-TRIPS BY VEHICLE TYPE
TRUCKS OVER 10,000 POUNDS GVW

BOROUGH	<u>1</u>	<u>2</u>	<u>3</u>	VEHICLE TYPE				<u>6</u>	<u>TT</u>	<u>% OF TOTAL EXTERNAL TRIPS</u>
				<u>SU</u>	<u>4</u>	<u>5</u>	<u>6</u>			
BRONX										17.5
% OF EXTERNAL BRONX TRIPS	14.3	75.5	7.1	97.9	-	3.1	-	-	3.1	
BROOKLYN										20.9
% OF EXTERNAL BROOKLYN TRIPS	6.0	76.1	2.5	84.6	9.4	4.3	1.7	15.4		
MANHATTAN										27.3
% OF EXTERNAL MANHATTAN TRIPS	9.2	59.5	1.3	70.0	5.9	21.5	2.6	30.0		
QUEENS										30.9
% OF EXTERNAL QUEENS TRIPS	11.6	61.8	2.3	75.7	13.3	8.7	2.3	24.3		
RICHMOND										3.4
% OF EXTERNAL RICHMOND TRIPS	15.8	15.8	10.5	42.1	47.4	10.5	-	57.9		
TOTAL EXTERNAL TRIPS	10.4	65.0	3.2	78.6	7.7	11.6	2.1	21.4		100.0

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

Table 24 shows a significantly different trip pattern trend against vehicle type. The prominence of the single unit truck performing internal-external trips in the Bronx reduced slightly. However, significant shifts of this type trip were reported in the other boroughs. In Richmond, a higher percentage of internal-external trips was performed by the larger tractor-trailer combinations than by single unit trucks.

The characteristics of the internal-internal trips between the 5 New York City boroughs were analyzed and are presented in Table 25. Trips in both directions on linkages between boroughs as a percentage of total interborough trips by vehicle type are shown. For the proper interpretation of these data, Table 26 indicates the division of total trips by borough which fall under the following categories: Internal - those totally within the borough; External - One trip-end in the city associated with the specific borough and the other external to the city; and Inter-borough - internal-internal trips between boroughs.

Trip Characteristics by Single Unit and Tractor-Trailer Combination Aggregations

To explore if a meaningful set of trip characteristics could be assembled from the survey data by the single unit/combination aggregation, a series of analyses were run.

Distribution of Trips by GVW and Industry Type - Table 27 shows the results of this processing of reported trips. The percentage of trips among the various sizes of single unit trucks contains two peaks. The largest occurs with trucks of GVW in the range from 16,001 to 19,500 pounds with about 26 percent of total trips. The smaller peak appears to relate to the 10,001 to 14,000 pound GVW category. As expected, tractor-trailer trips were largely performed by vehicles of greater than 33,000 pounds GVW.

Distribution of Expanded* Truck-Miles by Industry Type and GVW - The stratification of survey data for expanded* truck-miles

* Expanded truck-miles equals airline distance times 1.21.

TABLE 25

NEW YORK CITY DATA

STATISTICAL ANALYSIS OF INTERBOROUGH TRIP CHARACTERISTICS
BY VEHICLE TYPE

FOR TRUCKS OVER 10,000 POUNDS GVW

LINKAGES (BOTH DIRECTIONS)	VEHICLE TYPE										% OF TOTAL INTERBOROUGH TRIPS
	1	2	3	4	5	6	7	8	9	10	
	%	%	%	%	%	%	%	%	%	%	
BRONX-BROOKLYN	11.0	73.4	2.2	87.6	13.4	-	-	-	13.4	4.3	
BRONX-MANHATTAN	15.0	78.1	2.3	95.4	1.1	3.5	-	-	4.6	16.7	
BRONX-QUEENS	14.8	64.8	7.4	87.0	11.1	1.9	-	-	13.0	5.2	
BRONX-RICHMOND	-	100.0	-	100.0	-	-	-	-	-	0.1	
BROOKLYN-MANHATTAN	16.6	71.3	3.1	91.0	2.8	4.1	2.1	9.0	27.7		
BROOKLYN-QUEENS	9.1	85.5	2.3	96.9	1.0	0.7	1.4	3.1	28.6		
BROOKLYN-RICHMOND	33.3	66.7	-	100.0	-	-	-	-	0.3		
MANHATTAN-QUEENS	16.8	75.1	4.0	95.9	0.7	3.5	-	4.0	16.6		
MANHATTAN-RICHMOND	-	66.7	-	66.7	-	33.3	-	33.3	0.3		
QUEENS-RICHMOND	-	-	-	100.0	-	-	-	-	0.2		
TOTAL INTERBOROUGH TRIPS	13.8	76.8	3.1	93.7	2.7	2.7	0.9	6.3	100.0		

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

TABLE 26
NEW YORK CITY DATA
 SUMMARY OF STATISTICAL ANALYSIS
 OF TRIP CHARACTERISTICS
 FOR TRUCKS OVER 10,000 POUNDS GVW

	<u>INTERNAL</u> <u>% OF</u> <u>TOTAL</u> <u>TRIPS</u>	<u>EXTERNAL</u> <u>% OF</u> <u>TOTAL</u> <u>TRIPS</u>	<u>INTERBOROUGH</u> <u>% OF TOTAL</u> <u>TRIPS HAVING</u> <u>ONE TRIP-END</u> <u>IN BOROUGH</u>
BRONX	9.0	1.0	2.72
BROOKLYN	26.9	1.2	6.31
MANHATTAN	33.4	1.5	6.35
QUEENS	13.4	1.7	5.23
RICHMOND	<u>1.3</u>	<u>0.2</u>	<u>0.09</u>
TOTAL TRIPS	84.0	5.6	10.4

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

TABLE 27

NEW YORK CITY DATA

DISTRIBUTION OF TRUCK-TRIPS BY
SINGLE UNIT AND TRACTOR-TRAILER, INDUSTRY TYPE
AND GROSS VEHICLE WEIGHT CATEGORY

VEH TYPE	HUSI/ INDUS	6,000 10,000	PERC/ TOTAL	10,001 14,000	PERC/ TOTAL	14,001 16,000	PERC/ TOTAL	16,001 19,500	PERC/ TOTAL	19,501 26,000	PERC/ TOTAL	26,001 33,000	PERC/ TOTAL	33,001 AND UP	PERC/ TOTAL
	2	250	2.21	608	5.38	304	2.69	896	7.93	526	4.65	188	1.66	107	.95
	3	88	.78	552	4.88	372	3.29	772	6.83	582	5.15	348	3.08	178	1.57
	4	195	1.73	514	4.55	451	3.99	944	8.35	370	3.27	155	1.37	198	1.75
SU	5	210	1.86	240	2.12	113	1.00	165	1.46	145	1.28	58	.51	249	2.20
	9	132	1.17	232	2.05	111	.98	167	1.48	64	.57	357	3.16	128	1.13
Subtotal		875	7.74	2146	18.99	1351	11.95	2944	26.05	1687	14.93	1106	9.79	860	7.61
	2											10	.09	38	.34
	3			4	.04			20	.18	13	.12	24	.21	134	1.19
TT	4	1	.01									5	.04	24	.21
	5							5	.04			4	.04	35	.31
Subtotal	9	1	.01	4	.04			25	.22	13	.12	43	.38	17	.15
TOTAL		876	7.75	2150	19.02	1351	11.95	2969	26.27	1700	15.04	1149	10.17	1108	9.80

INDUSTRY CODE

- 2 - Manufacturing
- 3 - Utility, Communications and Transportation
- 4 - Wholesale
- 5 - Retail
- 9 - All Other

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

by industry type and GVW stratum is shown in Table 28. The distribution indicated here followed the previous presented patterns.

Statistical Analysis of Truck-Trips - An analysis of truck-trips was performed on the single unit/combination aggregation by industry type. This analysis, summarized in Table 29, failed to show recognizable relationships which could be used to simplify and collect trip characteristics into smaller cells.

Trip Characteristics by GVW Stratum

An analysis of travel characteristics by GVW categories, similar to those performed by vehicle type (Table 21, for example). The results is given in Table 30. When compared to the analyses performed by vehicle type, the trip characteristics are about equally distributed in all GVW stratum with little apparent trends or patterns evident.

Time Distribution of Truck Trips

The mid-point time of all trips reported in the survey were collated as shown in Table 31. This collation was made against type of industry within each vehicle type. The total truck trips are distributed such that about 89.6 percent of all trips have their mid-point time within the hours of 6 A.M. and 6 P.M. A plot of this distribution is shown in Figure 5. The major activity between midnight and 6 A.M. are trips performed by the manufacturing industry trucks. Wholesale industry trucks begin their trips around 2 A.M. whereas the Utility/Communications/Transportation reports their earlier moves starting about 4 A.M. Most of this movement is the familiar 2-axle, dual-rear-tire truck.

To demonstrate any dramatic shifts in time distribution of trips, data of bridge crossings in 1964 and 1971 made by the New York City Department of Public Works were overlaid on the survey data. There appears to be slight shifts in night truck trips in both the 1964 and 1971 bridge crossings. The peak hour activity at the

TABLE 28

NEW YORK CITY DATA

DISTRIBUTION OF EXPANDED TRUCK-MILES
BY SINGLE UNIT AND TRACTOR-TRAILER, INDUSTRY TYPE
AND GROSS VEHICLE WEIGHT CATEGORY

VEH TYPE	PERC/ TOTAL	6,000 10,000	PERC/ TOTAL	10,001 14,000	PERC/ TOTAL	14,001 16,000	PERC/ TOTAL	16,001 19,500	PERC/ TOTAL	19,501 26,000	PERC/ TOTAL	26,001 33,000	PERC/ TOTAL	33,001 AND UP	PERC/ TOTAL
2		261.54	.64	1065.60	3.42	654.75	2.10	1967.92	6.31	919.83	2.95	821.72	2.64	390.92	1.25
3		139.11	.45	981.54	3.15	704.92	2.26	2723.75	8.74	1312.61	4.21	611.46	1.96	844.96	2.71
4		408.00	1.31	1305.94	4.19	903.19	2.90	2365.05	6.63	1033.93	3.32	778.44	2.50	820.39	2.63
5		232.23	.75	487.82	1.57	321.95	1.03	674.50	2.16	165.02	.53	173.35	.56	607.67	1.95
9		405.58	1.30	821.86	2.64	315.28	1.01	763.54	2.45	215.50	.69	616.69	1.98	683.76	2.19
Subtotal		1446.56	4.64	4662.76	14.96	2900.09	9.31	8194.76	26.29	3646.89	11.70	3001.66	9.63	3347.70	10.74
2															
3				17.69	.06			260.14	.83	181.32	.58	486.09	1.56	908.82	2.92
4		7.20	.02									138.18	.44	1240.18	3.98
5								15.62	.05			23.56	.08	254.02	.82
9		7.20	.02	17.69	.06			275.76	.88	181.32	.58	673.81	2.16	237.20	.76
Subtotal															
TOTAL		1453.76	4.66	4680.45	15.02	2900.09	9.31	8470.52	27.18	3828.21	12.28	3675.47	11.79	6159.28	19.76

INDUSTRY CODE

- 2 - Manufacturing
- 3 - Utility, Communications and Transportation
- 4 - Wholesale
- 5 - Retail
- 9 - All Other

* NOTE: EXPANDED TRUCK-MILES EQUALS AIRLINE DISTANCE TIMES 1.21.

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

TABLE 29
NEW YORK CITY DATA

STATISTICAL ANALYSIS OF TRUCK-TRIPS BY
SINGLE UNIT AND TRACTOR-TRAILER COMBINATIONS BY INDUSTRY
Average and Deviation of Number of
Trips & Miles, Speed, and Daily Soak-Time,
and Number of Trips Where Soak-Time Exceeded 90 Minutes

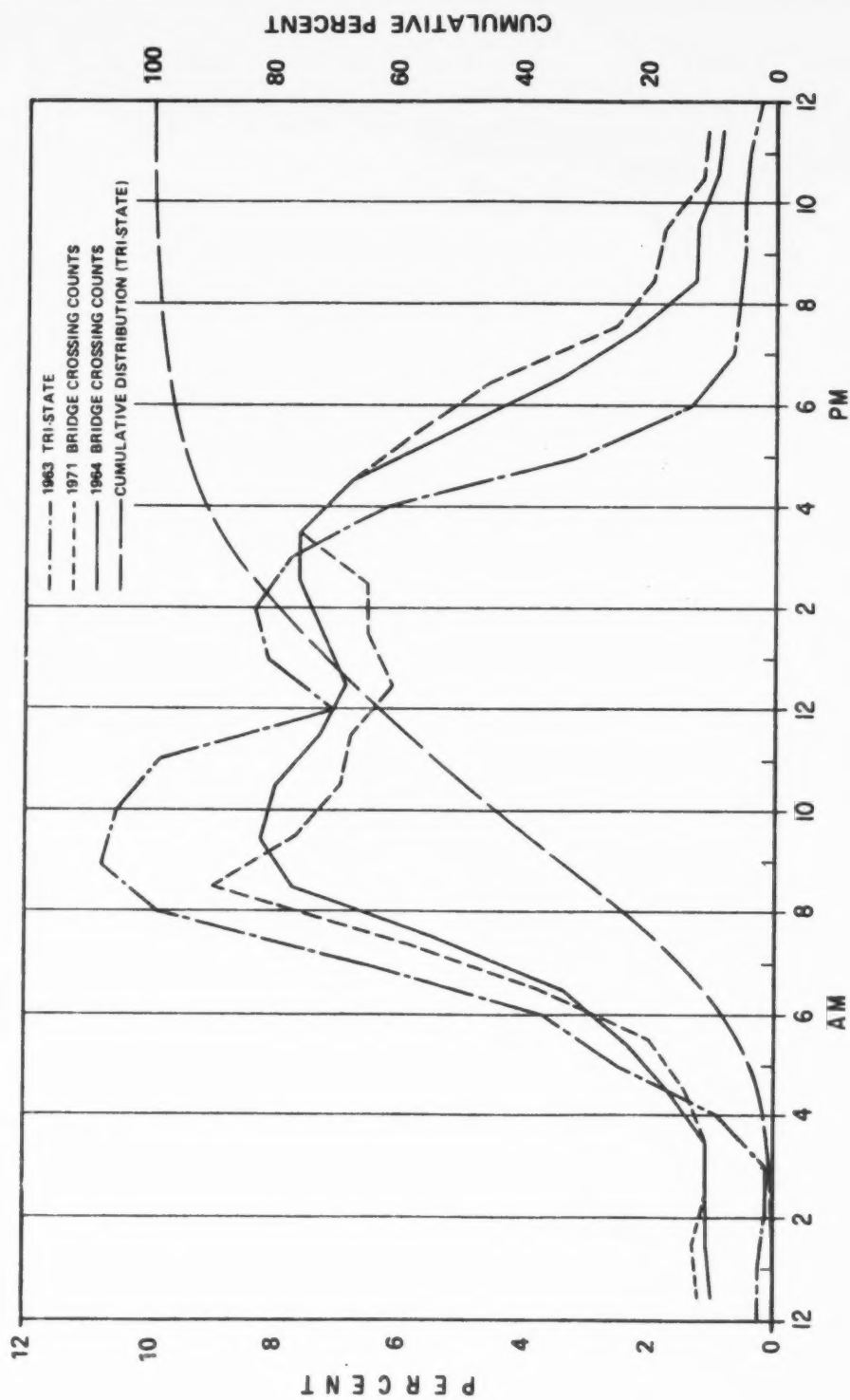
		NO. TRIPS PER DAY		NO. MILES PER TRIP		NO. MILES PER TRUCK		SPEED (MPH)		DAILY SOAK-TIME PER TRUCK		NO. TRIPS ≥ 90 MIN. SOAK TIME
GVW	IND	AVG.	DEV.	AVG.	DEV.	AVG.	DEV.	AVG.	DEV.	AVG.	DEV.	
SINGLE UNIT TRUCKS												
10-14,000	2	15.6	12.2	01.8	03.8	27.3	12.4	07.3	05.5	30.6	34.2	18
	3	13.1	11.1	01.8	05.4	23.4	14.8	07.8	05.1	96.1	72.2	20
	4	12.0	09.9	02.5	12.1	30.4	24.6	10.3	08.4	62.0	64.4	16
	5	10.9	11.9	02.0	10.5	22.2	21.8	07.4	10.4	63.6	70.3	11
	9	06.3	05.7	03.5	09.8	22.2	19.8	08.3	11.2	90.4	93.5	30
14-16,000	2	11.7	11.4	02.2	07.2	25.2	15.8	08.3	03.9	88.8	72.7	12
	3	11.3	09.3	01.9	03.1	21.4	14.2	06.0	03.3	68.5	58.8	23
	4	15.0	11.6	02.0	05.8	30.1	20.9	08.2	09.2	90.3	54.8	12
	5	14.1	15.3	02.8	05.6	40.2	27.8	11.4	06.9	62.5	39.3	3
	9	09.3	09.1	02.8	05.9	26.3	16.5	07.8	04.8	54.9	81.5	7
16-19,500	2	16.3	20.5	02.2	21.7	35.8	24.9	09.5	06.5	74.9	58.9	22
	3	08.7	07.3	03.5	07.2	30.6	33.4	09.4	08.0	51.6	61.5	73
	4	12.9	12.7	02.2	10.9	28.3	21.1	09.0	15.5	68.2	74.1	33
	5	08.7	08.4	04.1	08.2	35.5	26.0	12.4	17.3	91.7	95.9	4
	9	05.6	05.8	04.6	18.7	25.5	25.2	09.0	07.1	93.5	21.1	24
19.5-26,000	2	15.0	16.9	01.8	07.1	27.2	16.6	08.0	03.9	81.1	57.5	19
	3	14.4	32.0	01.5	08.5	21.4	13.8	06.4	05.7	54.7	59.6	26
	4	12.2	10.8	02.8	07.5	33.6	24.4	09.6	09.9	78.0	63.5	14
	5	19.3	17.9	01.3	01.7	24.4	13.6	07.7	02.3	98.0	81.1	1
	9	06.3	05.4	03.5	07.1	22.8	11.0	09.6	05.1	12.3	78.0	7
26-33,000	2	07.8	06.9	03.9	08.6	30.2	27.5	10.4	07.7	28.4	59.2	18
	3	11.1	13.9	02.7	07.8	29.7	37.5	09.1	07.4	42.1	58.9	34
	4	06.4	04.5	05.1	09.3	32.2	18.4	10.0	05.4	37.3	42.8	12
	5	12.4	09.7	01.2	02.2	27.4	18.3	07.6	02.6	23.9	47.1	2
	9	19.2	33.1	01.7	06.9	33.0	31.5	07.9	04.6	08.8	44.0	10
Over 33,000	2	07.1	04.2	03.7	03.1	26.1	18.2	07.9	05.3	47.4	39.2	5
	3	05.9	04.7	04.7	09.6	28.2	25.0	07.3	05.7	22.4	58.5	26
	4	07.1	04.6	04.1	04.6	29.3	21.2	07.7	04.0	82.9	59.4	16
	5	10.8	06.7	02.4	01.9	26.4	17.4	08.5	04.4	15.8	41.6	8
	9	06.1	07.3	05.3	07.5	32.6	36.3	11.1	07.5	28.0	73.1	10
TRACTOR-TRAILER COMBINATIONS												
16-19,500	1	14.0	01.4	13.0	12.2	52.0	51.4	14.4	08.0	56.8	59.2	4
19.5-26,000	3	05.3	02.5	13.9	12.2	45.3	23.8	16.1	15.8	66.8	90.9	4
26-33,000	2	04.3	02.3	48.6	15.9	62.0	86.2	26.8	03.0	53.3	92.4	3
	4	06.0	05.7	05.8	15.9	34.6	27.5	10.6	07.2	77.5	98.4	5
	9	02.0	01.4	06.6	10.2	13.0	04.5	07.8	09.1	00.0	00.0	2
Over 33,000	2	04.2	02.3	23.9	49.4	01.0	39.5	18.9	09.0	08.3	35.4	5
	3	03.4	01.5	09.3	10.0	31.0	47.3	11.6	09.3	48.1	63.7	46
	4	03.4	01.6	10.6	04.9	36.3	33.7	13.9	05.6	94.3	96.4	5
	5	07.0	06.8	08.9	11.0	47.4	33.2	10.8	09.2	40.0	51.2	2
	9	04.3	02.6	10.1	04.7	42.8	38.5	10.2	03.5	33.8	98.4	2

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

TABLE 30
NEW YORK CITY DATA

SUMMARY OF URBAN TRUCK
TRAVEL CHARACTERISTICS BY GVW CATEGORY

	<u>GROSS VEHICLE WEIGHT CATEGORY</u>						
	<u>6,000</u> <u>10,000</u>	<u>10,000</u> <u>14,000</u>	<u>14,000</u> <u>16,000</u>	<u>16,000</u> <u>19,500</u>	<u>19,500</u> <u>26,000</u>	<u>26,000</u> <u>33,000</u>	<u>Over</u> <u>33,000</u>
<u>VEHICLE MILES</u>							
% OF TOTAL	4.6	15.0	9.3	27.2	12.3	11.8	19.8
<u>% OF TOTAL</u> <u>DAILY TRUCK-</u> <u>TRIPS</u>	7.0	19.0	11.9	26.3	15.0	10.2	9.8
<u>TRUCK</u> <u>POPULATION</u>							
% OF TOTAL							
<u>TRI-STATE</u> <u>SURVEY</u>	5.5	17.5	10.4	25.9	12.7	10.7	17.3
<u>AVG. MILES</u> <u>PER TRIP</u>							
(MILES)	1.62	2.18	2.14	2.85	2.26	3.20	5.56
<u>AVG. MILES</u> <u>PER TRUCK</u>							
(MILES)	25.1	25.4	26.8	31.2	28.8	32.8	34.1
<u>AVG. TRIP</u> <u>SPEED</u>							
(MPH)	7.5	8.5	8.0	9.7	8.3	6.9	10.4
<u>AVG. NUMBER</u> <u>TRIPS PER</u> <u>TRUCK PER</u> <u>DAY</u>	15.1	11.7	12.4	10.8	12.8	10.2	6.1



COMPARISON OF TIME DISTRIBUTION OF TRUCK TRIPS
BETWEEN 1963-4 AND 1971

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FIGURE 5

TABLE 31
NEW YORK CITY DATA
TIME DISTRIBUTION OF TRUCK-TRIPS FOR TRUCKS OVER 10,000 POUNDS GVW
BY VEHICLE TYPE AND INDUSTRY TYPE

VEH. TYPE / INDUSTRY	1	2	3	4	5	6	7	8	9	10	11	12	TOTAL
1 - 0							1	2			2	1	6
1 - 1							1	1					2
1 - 2				1	17	28	28	28	37	39	26	24	228
1 - 3			2		13	15	21	32	37	45	41	36	209
1 - 4							26	36	38	38	34	32	215
1 - 5	1					1	6	8	9	8	6	5	44
1 - 6						1	5	10	10	9	7	3	45
Subtotal	1		2	1	30	45	74	109	129	136	118	101	750
2 - 0							45	67	41	35	31	41	260
2 - 1						2	1	2	1	2	2		10
2 - 2						4	16	21	20	12	14	10	97
2 - 3	11	6	1	27	100	148	169	223	228	230	203	149	1495
2 - 4				41	68	73	109	129	240	249	244	163	1416
2 - 5		2	3	12	58	99	143	222	280	243	243	147	1452
2 - 6		1	1	6	5	11	52	80	93	107	94	71	522
2 - 7							1	2	1	1	1		8
2 - 8							2	2	2	1	2		8
Subtotal	11	10	4	84	232	339	551	864	921	897	853	597	5377
3 - 0		1		2	1	1	1	1	1	2	1	1	13
3 - 1							9	5	7	7	6	3	37
3 - 2							2	2	5	7	6	4	21
3 - 3							2	7	8	6	7	5	35
3 - 4						1	3	6	9	8	9	3	39
3 - 5							3	2	4	4	5	4	22
Subtotal	1	1		2	1	2	20	27	37	37	36	20	179
4 - 0					1	1	1	6	1	3	2	2	1
4 - 1						2	6	5	7	9	6	1	20
4 - 2							1	2	3		3		36
4 - 3				1		1	1	2	1		1		9
Subtotal				1	1	4	12	14	17	12	12	4	72
5 - 0							1		1	1			1
5 - 1							2		2	2	1	2	7
5 - 2			1	1	1	3	11	11	9	6	5	6	56
5 - 3							1		1	1	1	2	6
5 - 4							2	2	1	3	2	2	12
Subtotal	1		1	1	1	3	15	13	12	13	9	17	82
6 - 0							1		1		1		2
6 - 1					1	1	3	4	2	5	4	1	21
6 - 2						1	3	2	2	3	1	1	13
Subtotal					1	2	6	6	5	8	6	2	36
7 - 0								1	2	1			4
TOTAL	21	11	12	94	265	396	678	1034	1118	1102	1032	736	6500
% IN HOUR TO TOTAL	0.2	0.1	0.1	0.9	2.5	3.7	6.5	9.9	10.8	10.5	9.9	7.1	
CUMULATIVE %	0.2	0.3	0.4	1.3	3.8	7.5	14.0	23.9	34.7	45.3	55.2	62.3	

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

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TABLE 31 (CONTINUED)

NEW YORK CITY DATA

TIME DISTRIBUTION OF TRUCK-TRIPS FOR TRUCKS OVER 10,000 POUNDS GVW
By VEHICLE TYPE AND INDUSTRY TYPE

VEH. BUSI/ TYPE INDUSTRY	13	14	15	MID-POINT 16	17	18	19	20	21	22	23	24	TOTAL
1 -		1	2										3
1 0				1									1
1 1			2										2
1 2	20	10	24	10	7	5	3					1	88
1 3	54	63	63	64	30	11	5	2	1				293
1 4	37	29	26	30	23	11	5			1			162
1 5	5	9	7	8	1	2	1				1	1	38
1 6	6	9	7	4	2	1	1						29
Subtotal	133	121	131	117	63	29	15	2	1	1	1	2	616
2 -	83	32	14	37	12	14	10	7	6	8	1		179
2 0		2	3	2									7
2 1	11	18	19	15	3	2				1			69
2 2	170	164	141	106	49	15	19	35	25	21	26	13	784
2 3	156	189	191	151	77	37	9	2	2				814
2 4	174	180	152	113	63	19	6	8	6	7	3	3	734
2 5	85	84	68	42	24	13	4	1	1	1	1	1	325
2 6	1		1	1			1		1	1			7
2 7	1	2	4										7
Subtotal	107	686	604	470	239	107	51	56	44	43	36	21	3020
3 -		1	1		1	1	1	1	1	1		2	11
3 0		5	7	9	1		1						30
3 1		4	3	3		1							13
3 2		8	10	4	4	1							37
3 3	10	8	8	3	2	2	1						30
3 4	8	6	3	3	3								19
Subtotal	18	31	33	30	11	5	3	1	1	1		2	152
4 -		1	1										1
4 0		3	3	2	2	1		1		1			13
4 1		5	10	7	2	4	1	2	1	2	1		42
4 2		1	2	4			1						9
Subtotal	17	9	17	13	7	6	2	3	1	3	1		75
5 -		1	1										1
5 0		3	1		2								6
5 1		9	7	9			3						32
5 2		1	1	1	1								5
Subtotal	1	12	12	10	4		3						48
6 -		1											8
6 0		1											1
Subtotal	1	2	1	1	1								14
7 -													1
7 0			1										1
Subtotal	1		1										2
TOTAL	244	1752	1902	1449	325	147	74	62	47	48	38	25	3927
% IN HOUR TO TOTAL	8.7	8.3	7.7	6.2	3.1	1.4	0.7	0.6	0.5	0.5	0.4	0.2	
CUMULATIVE %	70.4	78.7	86.4	92.6	95.7	97.1	97.8	98.4	98.9	99.4	99.8	100.0	

bridge does not coincide in magnitude or time with survey trips. There are two factors worthy of consideration here. One is the fact that Tri-State survey data shown here covers all trips, not those related to bridge crossings only. Secondly, 1964 and 1971 bridge crossings tract each other reasonably well, thus substantiating the fact that truck travel patterns have not shifted significantly since 1964. It is not likely that patterns shifted between the 1963 Truck-Taxi Survey and 1964.

Chapter 5

ROADWAY TYPES USED IN TRUCK TRAVEL

Intensity of truck travel is indicated in terms of vehicle miles of travel (VMT). These data have been related to vehicle type, user industry type, and other truck and trip characteristics in Chapters 2,3, and 4. The intensity of truck travel by type of roadway was not indicated in the basic Tri-State Truck-Taxi Survey. The desirability of estimating these relationships to relative highway emissions is obvious.

Phase II of the program will instrument trucks and record data to define trip patterns by three categories of roadways--Expressways, Arterials, and Local Streets. A preliminary insight into the fraction of truck VMT committed on these three roadway types was developed through a combination of data from a variety of sources.

The methodology employed in developing this estimate was to generate a network of expressways and arterials. Using volume counts obtained for these linkages, daily truck VMT by these facilities were estimated. Next, an estimate of total daily truck VMT was made from other source data. The difference between the total VMT and that assigned to expressways and arterials was assumed to be that truck travel on local streets.

Estimation of Truck VMT on Arterials and Expressways

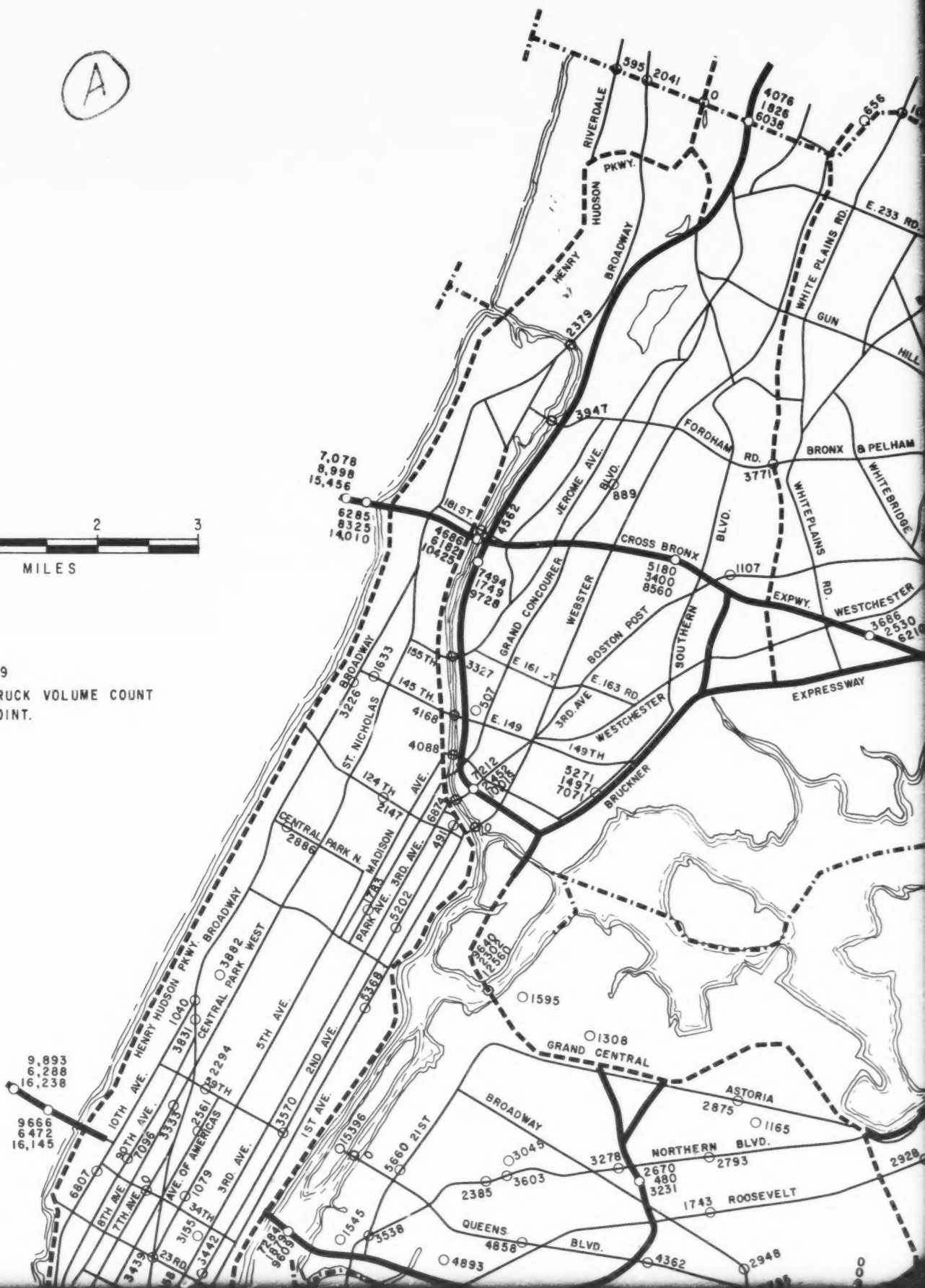
The network shown in Figure 5-1 was assumed, based upon both judgment and cordon count locations contained in the

(A)



LEGEND:

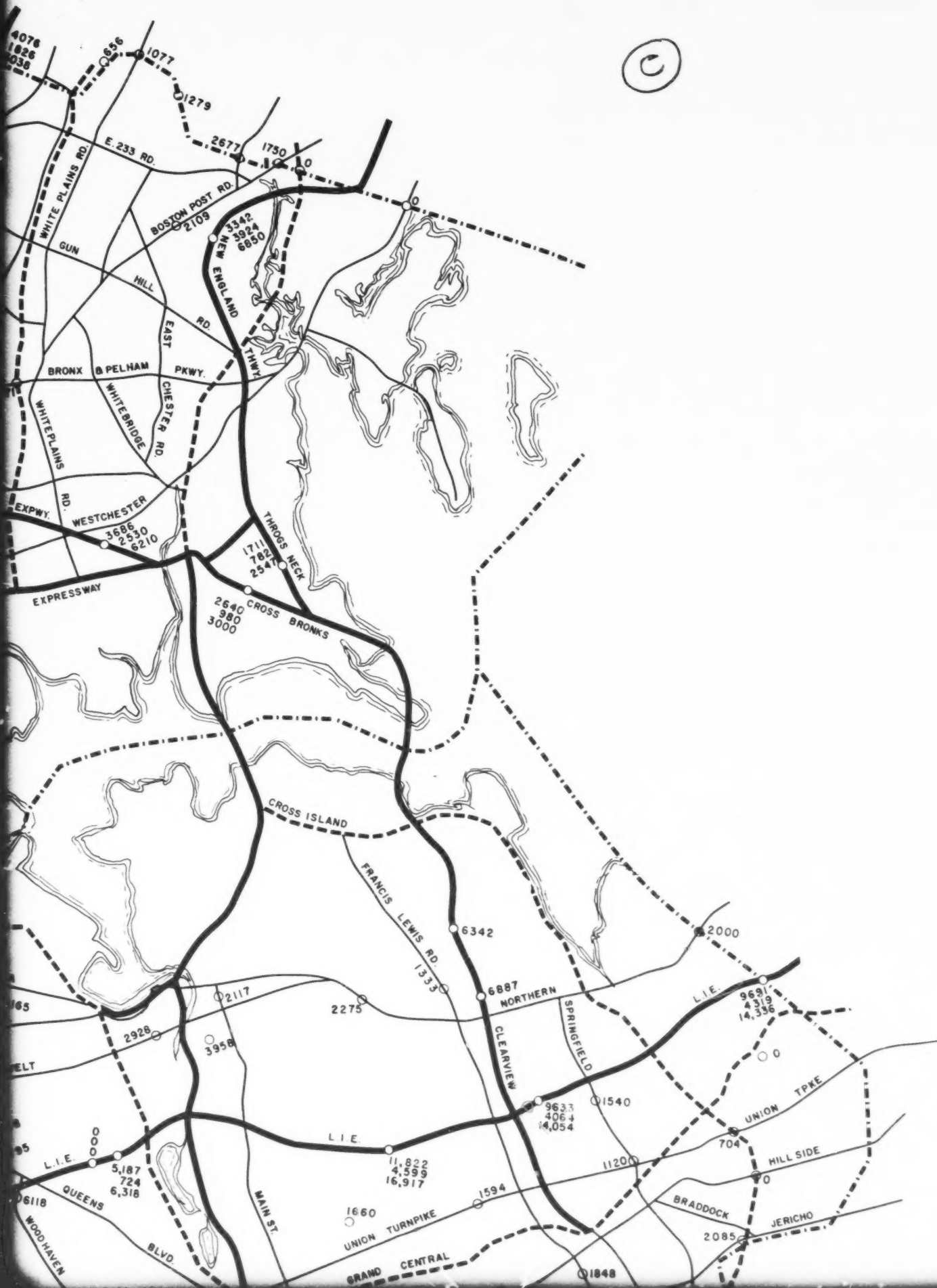
9999
LOCATION & TRUCK VOLUME COUNT
AT CORDON POINT.





(B)

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1963 "Vehicle Classification and Vehicle Occupancy Report".*
 The network comprises about 445.5 miles of roadways identified therein as Arterials and about 106.6 miles identified as Expressways.

This network was divided into short analysis segments. The length of each segment was scaled. A direct truck volume count was available for about 35 percent of these segments from the classification report. Volumes for the remaining segments were estimated by association with these counts and extensions of these data to continuous portions of a given facility. VMT estimates were obtained from the product of truck volumes on each segment and segment length. The estimates derived by these means is given in Table 32.

Table 32
 TRUCK MILEAGE BY TYPE OF ROADWAY

	<u>URBAN ARTERIALS</u>		<u>EXPRESSWAYS</u>	
	<u>Miles</u>	<u>Truck-Miles</u>	<u>Miles</u>	<u>Truck-Miles</u>
Brooklyn	96.3	278,400	24.8	134,700
Queens	141.9	331,700	33.4	353,100
Bronx	74.2	101,000	31.2	216,900
Manhattan	90.8	408,900	0	0
Staten Island	42.3	44,200	17.2	27,100
TOTAL	445.5	1,164,200	106.6	731,800

An average of about 1,164,200 daily vehicle miles of truck travel are performed on urban arterials, and about 731,800 vehicle miles on expressways in New York City.

*These were annual counts taken by the New York State Department of Highways.

Estimation of Total VMT

Bridge volumes for 18 major bridges* indicate that about 175,000 trucks crossed in a typical day. This volume included through trucks. The Port of New York Authority estimated during a comparable period that about 21.3 percent of trucks crossing Staten Island and Trans-Hudson bridges were performing through trips. Applying this factor to the total daily volume of 175,000 trucks produces an estimate of about 137,500 trucks engaged in travel internal to the Metropolitan area.

In the sorted data for trucks performing "eligible" trips in New York City derived from the Tri-State Truck-Taxi Survey, 1,047 trucks reported a total daily travel of 25,771 airline miles. Based upon Bureau of Census estimates that over-the-road mileage is 21 per cent higher than airline miles, the total daily travel in the sample expands to 31,180 roadway miles.

This selected data sample was processed to determine the number of trucks reporting trips which crossed the same 18 bridges. The results indicated that 1,135 trucks made trips involving these bridges.

By comparing these 1,135 trucks in the selected sample to the total daily counts of 137,500 trucks performing internal metropolitan trips, provides an expansion factor for estimation purposes of 0.0083. Applying this factor to the 31,180 truck miles reported in the sample data set, results in a total VMT

*Derived from data in the 1963-64 "Comparison of Bridge Traffic" made by the New York City Department of Public Works.

estimate of about 3,757,000 vehicle miles daily. One can arrive at an estimate that about 19.5 percent of truck VMT is committed on the portion of the network identified as Expressways, about 31 per cent on those network facilities identified as Arterials, with the remaining 49.5 percent of truck travel committed on facilities not included in the network and therefore termed Local Streets.

Chapter 6

CONCLUSIONS

A major objective of Phase II of the program is to develop a profile of engine operation variables employed in urban truck population use. As has been cited, the two study areas are the Los Angeles Basin and New York City. A sample plan design will be based upon data assembled in Phase I, and 50 trucks in each area will be instrumented. An instrumental survey will be conducted to accumulate up to 172 truck-days of data in each area by monitoring truck trips performing their usual trip patterns and normal use. Any given truck will be monitored from 1 to 5 days, depending upon the sample plan.

Parameters to be recorded include engine rpm, percent of maximum developed torque and vehicle speed against time in increments of less than 1 data set per second.

The sampling plan should statistically subdivide the truck population into as small a number of strata as are feasible due to the small number of trucks in the survey. Each strata should represent a segment of the population which has similar patterns of travel and use and the smallest variation of travel characteristics.

Subject to the restrictions in sample size and total truck-days of data to be assembled, the objective of the sample plan is to determine the distribution of trucks and days assigned to each strata which minimizes the variation of the estimated and the actual use profile in intensity of travel performed (VMT).

Intensity of travel performed by trucks within a given stratum is a basic emission characteristic since the magnitude of emission components produced by a vehicle, all other things remaining constant, depends upon distance traveled.

Potential Stratification Parameters

The data contained in this report should be analyzed to develop desirable stratification parameters. Comparisons should be made between truck, user and engine characteristics to aggregate data such that travel characteristics and use patterns are compartmentalized into meaningful and related groupings.

Engine Fuel Type - An obvious dimension, determined by the differenced in levels and composition of emissions, is that of fuel type. Two types of fuel predominate--gasoline and diesel. While the trip-making characteristics on this simple delineation can not be easily identified, this parameter must certainly be expected in any reasonable stratified sample.

User Industry Type - Eleven industry types were identified in the survey data. When considering the distribution of the fraction of total VMT generated, three user industry groups commit about equal travel intensity in New York City, and their total is a little over 75 percent of all truck VMT. These are: Wholesale Utilities/Communication/Transportation, and Manufacturing. Combining the remaining user industry types under a category of Other results in four industry groups that generate about equal VMT in the urban area. The basic three industry group travel characteristics, while varying even within each group to some extent, can be considered as somewhat similar because of truck usage and trip purpose.

Truck Characteristics - Within the eight strata suggested above, travel characteristics vary according to truck characteristics. Two aggregations of travel characteristics were performed in the data analysis of this study.

One aggregation was based upon vehicle type which employed number of axles as a parameter to more grossly separated vehicle type into single-unit trucks and tractor-trailer combinations.

The second aggregation was based upon the vehicle's gross vehicle weight, which was divided into seven weight intervals or classes.

A third possible aggregation, that which might have employed body type as a set of parameters, was not extensively employed in the data analysis. This was justified on two bases; the number of body types was large, with twelve categories defining the survey; and the apparent discrepant definition of body types between survey data and registration data.

Recommended Stratification Parameters

It is recommended that the two engine fuel types--gasoline and diesel--be employed as basic parameters within the sample plan. Likewise, the aggregation of four user industry types discussed above in the sample plan design would parametrically divide total VMT by approximately equal groupings. Thus, a matrix of 2 x 4 has been formed thus far.

There remains a task of selecting between vehicle type and gross vehicle weight for a set of truck characteristics parameters to be included.

Aggregating by Vehicle Type - One dominant vehicle type consistently emerged in the study data processing. This vehicle type was the 2-axle, dual rear tire truck. This dominance was found regardless of whether the population included the 6-10,000 pound GVW class or not. This vehicle type represented about 73 percent of the total population of trucks over 6,000 pounds GVW. This type generates about 70 percent of the total truck VMT in performing about 78 percent of total truck trips. Their trips accounted for over 76 percent of all internal-internal trips and in so doing accumulated about 47 percent of internal-internal trip mileage. In the internal-external trip category, this type traveled about 23 percent of that category mileage and made about 60 percent

of the trips. The same pattern exist even when the 6-10,000 pound GVW class is dropped from the data.

Combining the 2-axle, single rear tire truck statistics with those of the 2-axles dual results in a group representing about 87 percent of the total population. When including all trucks over 6,000 pounds GVW, this grouping would account for about 94 percent of all truck trips and would generate about 84 percent of all truck WMT.

About 4 percent of the truck population is the 3-axle dual rear tire truck. This category accounts for about 5 percent of internal-internal trip mileage and about 4 percent of internal-external trip mileage.

The remainder of the VMT is generated by tractor-trailer combinations of all types.

An analysis of variance between various pairings of vehicle types and their travel characteristics of trip speed, number of trips per day, and miles per trip was conducted. These tests employed the following procedures: (*)

Let:

α = significance level of test - 0.05

$\bar{X}_A$ = mean of variable for vehicle type A

$\bar{X}_B$ = mean of variable for vehicle type B

S_A^2 = standard deviation of variable for vehicle type A

S_B^2 = standard deviation of variable for vehicle type B

n_A = number of measurements of variable for vehicle type A

n_B = number of measurements of variable for vehicle type B

Then compute:

$$V_A = \frac{s_A^2}{n_A} = \text{variance of } \bar{X}_A$$

$$V_B = \frac{s_B^2}{n_B} = \text{variance of } \bar{X}_B$$

Compute "effective number of degrees of freedom", thus:

$$F = \frac{(V_A + V_B)^2}{\frac{A^2}{n_A + 1} + \frac{B^2}{n_B + 1}} - 2$$

From a table of "student t" distributions, obtain

$$t_{(1 - \frac{\alpha}{2})}$$

Compute:

$$u = t(1 - \frac{\alpha}{2}) \sqrt{V_A + V_B}$$

If:

$|\bar{X}_A - \bar{X}_B| > u$, decide that there is a significant difference in average performance of A and B; otherwise, decide that there is no reason to believe that A & B differ in average performance.

(*) For illustration of this method, see National Bureau of Standard Handbook 91, "Experimental Statistics" by Mary Gibbons Natrelle, August 1, 1963, pp. 3-26 through 3-30.

Table 33 shows the results of the above test procedure applied to statistical data of vehicle types as regard to trip speed, number of trips per day, and miles per trip.

Note that the 2-axle truck types indicate no significant travel characteristic difference. Thus, these types could be aggregated into one stratum parameter without affecting the travel characteristics of the combination (Types 1 and 2).

The test indicates only a significant difference in miles per trip between the 2-axle single rear tire group (Type 1) travel and the 3-axle dual group (Type 3) travel. However, the 2-axle dual rear tire (Type 2) travel shows significant differences in both number of trips per day and miles per trip when compared to the 3-axle dual group (Type 3). The conclusion from this test is that the Type 3 vehicle group should probably remain separate from the combined 2-axle group.

With these two single unit truck type groups generating over 90 percent of all truck VMT, it would appear logical to group all tractor-trailer combinations into a third group. Refer again to Table 33 to see what are the travel characteristic variances of such a combination.

Note that in most cases, the tractor-trailer combinations (Types 4, 5 and 6) travel characteristics are significantly different from the single unit trucks (Types 1, 2 and 3). There is no significant variance between type 4 and 6 or between types 5 and 6 within the tractor-trailer group. There is some variance indicated between type 4 and 5 in trip speed and miles per trip. This variance can be discounted when the small fraction of travel is accounted to the type 4 combinations.

Using vehicle type as a stratification parameter, a 2 x 4 x 3 matrix would be evident. Thus, 24 strata would be

Table 33

RESULTS OF VARIABILITY TESTS BETWEEN VEHICLE TYPES AND
THEIR TRAVEL CHARACTERISTICS

Comparison Between		TRAVEL CHARACTERISTICS									
Vehicle Type A	and	Vehicle Type B	Trip Speed			No. Trips per Day			Miles/Trip		
			$\bar{X}_A - \bar{X}_B$	μ	Different?	$\bar{X}_A - \bar{X}_B$	μ	Different?	$\bar{X}_A - \bar{X}_B$	μ	Different?
1		2	1.1	1.5	No	0.6	1.8	No	0.1	0.4	No
1		3	1.8	2.2	No	2.7	2.8	No	1.9	1.4	Yes
1		4	8.1	2.3	Yes	6.6	1.7	Yes	11.9	1.0	Yes
1		5	3.5	1.6	Yes	7.3	1.6	Yes	7.5	2.1	Yes
1		6	8.6	3.8	Yes	6.6	2.8	Yes	8.4	16.4	No
2		3	0.7	2.1	No	3.3	2.6	Yes	1.7	0.9	Yes
2		4	7.0	2.3	Yes	7.2	1.4	Yes	11.8	1.9	Yes
2		5	2.4	1.5	Yes	7.9	1.2	Yes	7.4	2.1	Yes
2		6	7.5	3.7	Yes	7.2	2.7	Yes	8.3	16.0	No
3		4	6.3	3.0	Yes	3.9	1.5	Yes	10.1	2.1	Yes
3		5	1.7	2.5	No	4.6	2.4	Yes	5.7	2.3	Yes
3		6	6.8	4.3	Yes	3.9	3.4	Yes	6.6	16.0	No
4		5	4.6	2.8	Yes	0.7	1.0	No	4.4	2.8	Yes
4		6	0.5	4.4	No	0.0	2.6	No	3.5	16.0	No
5		6	4.1	4.1	No	0.7	2.5	No	0.9	16.0	No

VEHICLE TYPE CODE

- | | | |
|-----------------|----|--------------------------|
| Single Unit | 1. | 2-axle, single rear tire |
| | 2. | 2-axle, dual rear tire |
| | 3. | 3-axle, dual rear tire |
| Tractor Trailer | 4. | 3-axle, tractor-trailer |
| | 5. | 4-axle, tractor-trailer |
| | 6. | 5-axle, tractor-trailer |

contained in the basic sample plan configuration.

Aggregating by GVW - With 6 GVW classes basically contained in the data, obtained by dropping the light truck category (6-10,000 pounds GVW), it would be required to combine these classes in some meaningful manner to reduce the total number of stratum levels in the basic sample plan configuration. If these strata cannot be reduced to 3 or less without combining strata with significantly different travel characteristics into the combinations, the aggregation by vehicle type appears the preferred strata parameter. Without such a combination, the basic sample matrix would have 48 strata into which only 50 trucks could be divided. This would appear to be an insufficient sample size which would result in inconclusive sample results.

Upon examination of data, no significant combinations of GVW classes appeared reasonable. It is therefore recommended the GVW not be applied as a strata parameter in a sample plan utilizing only a 50-truck sample size.

APPENDIX A

CALCULATION AND SELECTION OF STRATUM BOUNDARIES FOR GROSS VEHICLE WEIGHT (GVW) TRUCK CHARACTERISTICS

The problem is to select the best possible divisions or categories for the GVW characteristic. The lower limit is set by the requirements of the Phase II RFP at 10,000 lbs. From this point, there are two different sets of stratum boundaries that are candidates for selection.

The first set of boundaries are defined by prior usage. Their main advantage is that the results of any stratification using these conventional boundaries could be compared directly to other studies.

The second method of selecting the stratum boundaries is based solely on the statistical characteristics of the distribution of GVW in the Tri-State data.

The statistical method utilized is called the CUM $\sqrt{f(y)}$ RULE and is based on the work by Dalenius (1957) in determining the best stratum boundaries under proportional and Neyman allocation.

Conventional Boundaries - Listed below are the GVW stratum boundaries that are most commonly used:

GVW in Thousands

10 - 14
14 - 16
16 - 19.5
19.5 - 26
26 - 33
33+

Statistical Boundaries - Generally, the method used in the CUM $\sqrt{f(y)}$ RULE is to record the number of trucks that fall in GVW categories ranging from 10,000 lbs to 40,000+ lbs. in 1,000 lbs. increments. These values constitute the $f(y)$ function. Next the cumulative of $\sqrt{f(y)}$ distribution is determined. The stratum boundaries are then determined by dividing the CUM $\sqrt{f(y)}$ distribution into six equal increments. The Tri-State data were analyzed in this fashion and the following stratum boundaries were derived:

GVW in Thousands

10 - 13.5
13.5 - 17.0
17.0 - 20.4
20.4 - 26.5
26.5 - 33.9
33.9 +

Conclusions - The results of selecting the stratum boundaries by two different means are remarkably similar. Because there is no serious discrepancy between the "statistically best" stratum boundaries and the stratum boundaries that are currently in use, the currently used stratum boundaries will be used in this study.

Table A-1

NEW YORK CITY DATACALCULATION OF STRATUM BOUNDARIES FOR
GVW TRUCK CHARACTERISTICS

<u>GVW</u>	<u>TOTAL</u> <u>NUMBER</u> <u>F(GVW)</u>	<u>F(GVW)</u>	<u>CUM</u> <u>F(GVW)</u>
10 - 11,000	51	7.1	7.1
11 - 12,000	36	6.0	13.1
12 - 13,000	40	6.3	19.4
13 - 14,000	57	7.6	27.0
14 - 15,000	50	7.1	34.1
15 - 16,000	59	7.7	41.8
16 - 17,000	43	6.6	48.4
17 - 18,000	171	13.1	61.5
18 - 19,000	41	6.4	67.9
19 - 19,500	17	4.1	72.0
19.5 - 20,000	16	4.0	76.0
20 - 21,000	14	3.7	79.7
21 - 22,000	28	5.3	85.0
22 - 23,000	17	4.1	89.1
23 - 24,000	26	5.1	94.2
24 - 25,000	14	3.7	97.9
25 - 26,000	18	4.2	102.1
26 - 27,000	15	3.9	106.0
27 - 28,000	20	4.5	110.5
28 - 29,000	12	3.5	114.0
29 - 30,000	24	4.9	118.9
30 - 31,000	12	3.5	121.4
31 - 32,000	15	3.9	125.3
32 - 33,000	14	3.7	129.0
33 - 34,000	13	3.6	132.6
34 - 35,000	11	3.3	135.9
35 - 36,000	20	4.5	140.4
36 - 37,000	10	3.2	143.6
37 - 38,000	5	2.2	145.8
38 - 39,000	1	1.0	146.8
39 - 40,000	8	2.8	149.6
Over 40,000	113	10.6	160.2

To divide GVW into 6 strata:

$$\frac{160.2}{6} = 26.6$$

Taking increments at : 26.6; 53.2; 79.8; 106.4; 133.3

on CUM f(GVW) produces increments:

10 - 13.5
13.5 - 17.0
17.0 - 20.4
20.4 - 26.5
26.5 - 33.9
33.9+

APPENDIX B

1963 TRUCK-TAXI SURVEY

BUSINESS OR INDUSTRY CODES

0 - AGRICULTURE, FORESTRY, FISHERIES, AND MINING

Agriculture
Forestry
Fisheries
Coal Mining
Crude Petroleum and Natural Gas Extraction
Metal Mining
Non-metallic mining and quarrying, except fuel

1 - CONSTRUCTION

Airport Construction
Bricklaying
Building Construction
Building Wrecking
Cement Paving
Painting
Paperhanging
Street Repair



2 - MANUFACTURING

Aircraft and Parts
Apparel and Accessories
Bakery Products
Beverage Industries
Canning and Preserving Fruits, Vegetables and Sea Food
Confectionary and Related Products
Dairy Products
Drugs and Medicines
Electrical Machinery, Equipment and Supplies
Farm Machinery and Equipment
Floor Coverings, Except Hard Surfaces
Furniture and Fixtures
Glass and Glass Products
Grain - Mill Products
Knitting Mills
Lumber and Wood Products
Meat Products
Motor Vehicles and Motor Vehicle Equipment
Office, Computing and Accounting Machine
Paints, Varnishes and Related Products
Paperboard Containers and Boxes
Petroleum Refining
Photographic Equipment and Supplies (Continued on next page)

BUSINESS OR INDUSTRY CODES

Printing, Publishing and Allied Industries, Except Newspapers
Professional Equipment and Supplies
Pulp, Paper, and Paperboard Mills
Rubber and Plastic Products
Ship and Boat Building and Repairing
Synthetic Fibers
Tobacco Manufactures
Yarn, Thread and Fabric Mills

3 or C - UTILITIES, COMMUNICATIONS AND TRANSPORTATION

3=

Electric light and power
Electric - gas utilities
Gas and Steam Supply Systems
Petroleum and Gasoline Pipe Lines
Sanitary Services
Water Supply

Radio Broadcasting and Television
Telephone (wire & radio)
Telegraph (wire & radio)

Air Transportation

Railroads and Railway Express Service (If the vehicles are not used in freight service)
Street Railways and Bus Lines
Subways
Taxicab Service
Water Transportation

C=

Railroads and Railway Express Service (If the vehicles are used in freight service)
Trucking Service
United Parcel Service
Moving and Storage

4 - WHOLESALE TRADE

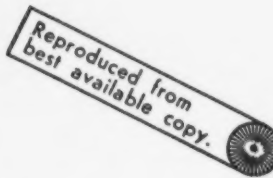
Drugs, Chemicals and Allied Products
Dry Goods and Apparel
Electrical Goods, Hardware, and Plumbing Equipment
Farm Products - raw material
Food and related products
Machinery, Equipment and Supplies
Motor Vehicles and Equipment
Petroleum Products
Miscellaneous Wholesale Trade
Not specified wholesale trade

5 - RETAIL TRADE

Apparel and accessory stores, except shoe stores
Dairy Products, Stores and milk retailing
Drug Stores
Eating and drinking places (Continued on next page)

BUSINESS OR INDUSTRY CODES

Food Stores, except dairy products
Fuel and Ice Dealers
Furniture and Housefurnishings Stores
Gasoline Service Stations
General Merchandise Retailing
Hardware and Farm Equipment Stores
Household Appliance, T. V. and Radio Stores
Jewelry Stores
Limited Price Variety Stores
Liquor Stores
Lumber and Building Material Retailing
Motor Vehicles and Accessories Retailing
Retail Florist
Shoe Stores
Miscellaneous Retail Stores
Not specified Retail Trade



6 - FINANCE, INSURANCE, REAL ESTATE, PROFESSIONAL, AND RELATED SERVICES

Banking and Credit Agencies
Insurance
Law Offices
Real Estate
Security and Commodity Brokerage and Investment Companies

7 - PROFESSIONAL AND RELATED SERVICES

Accounting, Auditing & Bookkeeping Services
Educational Services
Engineering & Architectural Services
Hospitals
Medical and other Health Services
Nonprofit Membership Services
Welfare and Religious Services
Miscellaneous Professional and Related Services

8 - BUSINESS, REPAIR, AND PERSONAL SERVICES

Advertising
Miscellaneous Business Services

Automobile Repair Services and Garages
Shoe Repair
Miscellaneous Repair Services

Barber and Beauty Shops
Dressmaking Shops
Hotels and Lodging Places
Laundering, Cleaning and Dyeing Services
Private Households

BUSINESS OR INDUSTRY CODES

9 - ENTERTAINMENT AND RECREATION SERVICES

Bowling Alleys, Billiard and Pool Parlors
Theaters and Motion Pictures
Miscellaneous Entertainment and Recreation Services

(-)- PUBLIC ADMINISTRATION

Federal Public Administration
International Public Administration
Local Public Administration
Postal Service
State Public Administration

APPENDIX C
Supplemental Tabulations

TABLE C-1

NEW YORK CITY DATA

NUMBER OF DAILY TRUCK-TRIPS OF
TRUCKS OVER 5,000 POUNDS GVM
BY VEHICLE TYPE AND INDUSTRY TYPE

VEH. INDUSTRY/ TYPE TRIP	TRUCK TRIPS										TOTAL
	1-2	3-4	5-9	7-9	9-10	11-12	13-14	15-16	17-UP		
1	0	4	3	1						14	
1	2									2	
1	1	2	2							17	
1	1	13	40	37	34	30	28	26	222	514	
1	2	52	89	65	52	45	31	25	48	527	
1	3	98	74	40	31	28	20	16	66	396	
1	4	82	63	50	31	28	6	6	149	259	
1	5	24	23	20	16	9				10	
1	6	2	2	2	2	2				10	
1	7	2	2	2	2	2				37	
1	8	20	12	8	8	6	4	2	21	79	
Subtotal	303	242	203	171	136	117	91	77	515	1855	
2	54	42	31	24	19	17	14	13	227	441	
2	0	4	3							17	
2	1	42	24	13	7	3	2	1		168	
2	2	288	247	204	174	144	125	115	668	2310	
2	3	343	243	181	147	130	110	93	631	2293	
2	4	386	307	210	193	167	145	129	573	2358	
2	5	150	122	88	60	66	48	37	190	880	
2	6	2	2	2	1					9	
2	7	6	1							15	
2	8	44	36	22	19	16	14	8	45	267	
Subtotal	1518	1190	934	745	640	543	458	396	2334	8758	
3	4	2	2	2	2	2	2	2	6	24	
3	1	14	10	8	7	5	3	1		67	
3	2	13	6	3	2					38	
3	3	20	12	4	4	4	2	2	18	72	
3	4	14	13	9	6	6	2	2	3	69	
3	5	16	14	9	6	6	2	2	10	41	
3	6	6	4	4	4	3	2	2		41	
3	8	2	2	2	2	2	2	2	8	28	
Subtotal	83	60	42	32	27	22	13	11	45	335	
4	1	8	6	2	1					2	
4	2	23	8	3	2	2	2			33	
4	3	7	4							78	
4	4	5	4	1						19	
4	8	2	2	1						16	
Subtotal	70	43	22	6	3	2	2			148	
5	1									2	
5	2	6	1							13	
5	3	25	8	1						88	
5	4	3								11	
5	5	6	2	2	2	2	2	2	1	16	
5	8	43	11	3						130	
Subtotal	73	43	11	3						2	
6	2	7	4							29	
6	3	2	2	2	2	2	2	2	1	19	
6	8	4	2	2	2	2	2	2	1	50	
Subtotal	24	9	6	2	2	2	2	2	1	6	
7	1	2	1							7	
7	8	1	1							7	
Subtotal	4	2	1							7	
TOTAL	2075	1589	1219	959	808	686	566	486	2895	11283	

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

TABLE C-2

NEW YORK CITY DATA

NUMBER OF TRUCKS BY GROSS VEHICLE WEIGHT
AND VEHICLE TYPE

GVW	VEHICLE TYPE							TOTAL
	1	2	3	4	5	6	7	
01			1				1	2
03	7	4						11
04	14	3						17
05	5	24		1				30
06	16	34			1			51
07	5	31						36
08	10	30						40
09	12	45						57
10	9	39	2					50
11	10	48	1					59
12	7	34		2				43
13	22	145	1	1	2			171
14	5	34	1				1	41
15	2	15						17
16	2	13	1					16
17	3	11						14
18	1	26		1				28
19	2	13	2					17
20	3	20		3				26
21		14						14
22	2	15	1					18
23		12		2	1			15
24	2	17		1				20
25	1	9		1			1	12
26	3	20		1				24
27	1	9	2					12
28	3	10	1	1				15
29	1	11		1	1			14
30		11		1	1			13
31		10		1				11
32	3	16	1					20
33		9			1			10
34		4			1			5
35		1						1
36		4	2	1	1			8
37	1	24	26	17	28	12		113
TOTAL	152	770	42	35	37	12	3	1051

GVW CODE

01	6- 7,000	20	23-24,000
03	7- 8,000	21	24-25,000
04	8- 9,000	22	25-26,000
05	9-10,000	23	26-27,000
06	10-11,000	24	27-28,000
07	11-12,000	25	28-29,000
08	12-13,000	26	29-30,000
09	13-14,000	27	30-31,000
10	14-15,000	28	31-32,000
11	15-16,000	29	32-33,000
12	16-17,000	30	33-34,000
13	17-18,000	31	34-35,000
14	18-19,000	32	35-36,000
15	19-19,500	33	36-37,000
16	19.5-20,000	34	37-38,000
17	20-21,000	35	38-39,000
18	21-22,000	36	39-40,000
19	22-23,000	37	Over 40,000

VEHICLE TYPE CODE

1 - 2 Axle - Single Rear Tires
2 - 2 Axle - Dual Rear Tires
3 - 3 Axle - Dual Rear Tires
4 - 3 Axle - Combination
5 - 4 Axle - Combination
6 - 5 Axle - Combination
7 - Other

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

TABLE C-3

NEW YORK CITY DATA

STATISTICAL ANALYSIS OF INTERNAL AND EXTERNAL

TRIPS BY BOROUGH AND GVW CATEGORY

BOROUGH	GROSS VEHICLE WEIGHT				TRIPS BY BOROUGH AND GVW CATEGORY				33,001 AND UP		% OF TRIPS TOTAL			
	10,001-14,000	14,001-16,000	16,001-19,500	19,501-26,000	26,001-33,000	INT.	EXT.	INT.	EXT.	INTERNAL	EXTERNAL			
BRONX														
% OF BRONX TRIPS	49.2	25.0	0.00	8.3	18.2	14.5	22.2	16.7	3.1	16.7	6.7	18.8	10.7	17.5
BROOKLYN														
% OF BROOKLYN TRIPS	42.3	20.9	12.8	11.9	22.7	16.4	16.7	28.4	2.9	6.0	2.7	16.4	32.0	20.9
MANHATTAN														
% OF MANHATTAN TRIPS	48.5	12.0	6.8	6.7	20.4	10.7	14.9	22.7	4.1	10.7	5.2	37.3	39.8	27.3
QUEENS														
% OF QUEENS TRIP	44.5	22.1	18.0	16.3	6.8	4.8	16.4	15.4	7.7	25.0	6.6	16.4	15.9	30.9
RICHMOND														
% OF RICHMOND TRIPS	28.6	6.2	-	-	-	-	35.0	25.0	16.9	-	19.5	68.8	1.6	3.4
TOTAL TRIPS	44.8	19.7	10.7	11.3	17.3	10.3	17.2	21.4	4.8	12.0	5.2	25.3		

Data Source: 1963 Truck-Taxi Survey, Tri-State Regional Planning Commission

TABLE C-4

NEW YORK CITY DATA

STATISTICAL ANALYSIS OF INTERBOROUGH
TRIPS BY LINKAGES AND GVW CATEGORIES

LINKAGES (BOTH DIRECTIONS)	GROSS VEHICLE WEIGHT						% OF TOTAL INTERBOROUGH TRIPS
	10,000 14,000 %	14,001- 16,000 %	16,001- 19,500 %	19,501- 26,000 %	26,001- 33,000 %	33,000 AND OVER %	
BRONX-BROOKLYN	46.2	7.7	15.4	7.7	-	23.0	4.3
BRONX-MANHATTAN	31.2	3.1	20.4	20.4	3.1	21.8	16.7
BRONX-QUEENS	18.8	-	25.0	25.0	12.4	18.8	5.2
BRONX-RICHMOND	33.3	-	-	-	66.7	-	0.1
BROOKLYN-MANHATTAN	27.2	1.9	18.4	27.9	6.1	20.2	27.7
BROOKLYN-QUEENS	27.8	6.9	22.9	25.7	2.8	13.9	28.6
BROOKLYN-RICHMOND	-	-	-	100.0	-	-	0.3
MANHATTAN-QUEENS	27.8	9.1	18.2	24.2	7.6	12.1	16.6
MANHATTAN-RICHMOND	-	-	-	-	-	100.0	0.3
QUEENS-RICHMOND	-	-	100.0	-	-	-	0.2
% OF TOTAL	28.8	5.0	20.6	23.5	5.0	17.1	

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

TABLE C-5

NEW YORK CITY DATASTATISTICAL ANALYSIS OF INTERNAL-INTERNAL
TRIP CHARACTERISTICS BY BOROUGH

BOROUGH	NO. TRIPS PER DAY		MILES PER TRIP		V.O. MILES PER TRUCK		SPEED (MPH)		DAILY SOAK-TIME PER TRUCK		NO. TRIPS 90 MIN. SOAK TIME	
	AVG.	DEV.	AVG.	DEV.	AVG.	DEV.	AVG.	DEV.	AVG.	DEV.	AVG.	DEV.
Bronx	36.4	10.4	01.0	01.9	09.0	08.4	05.4	05.4	15.9	68.1	44	
Brooklyn	10.7	16.1	01.3	02.3	13.6	12.5	06.2	05.5	18.9	60.5	118	
Manhattan	09.2	12.7	00.9	01.3	08.4	07.2	04.4	06.3	26.4	55.9	141	
Queens	07.7	09.2	01.8	02.5	13.8	11.9	07.7	06.3	03.7	53.0	63	
Richmond	09.5	05.5	00.1	03.0	29.6	20.2	11.5	05.6	68.8	54.5	4	

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning CommissionReproduced from
best available copy.

TABLE C-6

NEW YORK CITY DATAAVERAGE NETWORK SPEEDS BY
ROADWAY TYPE FROM TRI-STATE TRAFFIC MODEL

<u>COUNTY</u>	<u>ANALYSIS AREA NUMBER</u>	<u>AVERAGE SPEED - MPH</u>		
		<u>EXPRESSWAY</u>	<u>ARTERIAL</u>	<u>LOCAL</u>
Manhattan	001	27.7*	14.9	12.0
	002	29.0	15.7	12.5
	003	31.3	17.2	13.5
Bronx	004	32.1	17.2	13.8
	005	39.7	20.6	16.7
	006	37.6	19.9	16.1
	007	40.9	21.4	17.5
Kings	008	32.3	18.1	13.9
	009	----**	20.2	14.7
	010	33.8	19.0	14.5
	011	35.8	20.2	15.4
Queens	012	----**	29.4	20.7
	013	34.4	19.8	14.8
	014	37.3	21.6	16.0
	015	37.6	21.0	16.1
Richmond	016	52.8	29.7	22.2
	017	41.2	25.2	18.6
	018	60.0	33.5	25.0

* No trucks permitted on Manhattan Expressways.

** No expressways in analysis area.

Data Source: 1963 Truck-Taxi Survey Tri-State Regional Planning Commission

TABLE C-7

NINE COUNTY NEW YORK CITY AREA

1971 TRUCK REGISTRATIONS

LAST 10 YEARS MODELS

COUNTY	GROSS VEHICLE WEIGHT - LBS				
	10,000 OR LESS	10,001- 19,500	19,501- 26,000	OVER 26,000	TOTAL
BRONX	5,835	1,432	1,157	893	9,317
KINGS	11,481	3,355	3,209	2,326	20,371
QUEENS	8,042	1,811	1,712	1,090	12,655
NEW YORK	13,161	2,790	2,425	1,691	20,067
RICHMOND	2,886	429	261	339	3,915
N.Y.C. SUB-TOTAL	41,405	9,817	8,764	6,339	66,325
NASSAU	20,399	3,377	2,949	2,219	28,944
SUFFOLK	27,192	2,819	2,272	1,572	33,855
ROCKLAND	14,329	2,080	1,563	1,452	19,424
WESTCHESTER	4,153	437	427	384	5,401
TOTAL	107,478	18,530	15,975	11,966	153,949

SOURCE: R. L. POLK & CO.

Permission for further use must
be obtained from R. L. Polk & Co.

Table C-8

NINE-COUNTY NEW YORK CITY AREA

NUMBER OF VEHICLES REGISTERED BY BODY STYLE, WHEEL CODE, AND FUEL TYPE
 10% SAMPLE OF LAST 10 YEARS MODELS - 1971

BODY STYLE	WHEEL CODE														TOTAL	
	42		44		49		64		99							
	2-AXLE/REAR DRIVE		2-AXLE/4 WD		2-AXLE/UNKNOWN		3-AXLE		UNKNOWN							
	GASOLINE	DIESEL	GASOLINE	DIESEL	GASOLINE	DIESEL	GASOLINE	DIESEL	GASOLINE	DIESEL	GASOLINE	DIESEL	GASOLINE	DIESEL		
BUS	112	1											112	1		
COMPACT VAN	463												463			
DUMP	361	16											622	119		
FLAT-BED	149	6		1		1							229	22		
HOUSE CAR	2												15			
MOTOR HOME	4												4			
PANEL	608	18											620	18		
PICK-UP	780												1,088			
REFRIGERATOR	62	6											95	15		
STATION-BUS	20												28			
STAKE BED	484	7											611	10		
STATION WAGON	65												68			
TANK	85	14											198	90		
TRACTOR	155	107											272	321		
VAN	1,662	102											1,700	102		
VAN-CAMPER	1												1			
WRECKER	148	1											170	3		
UNKNOWN	392	8											508	33		
SUB-TOTAL	5,553	286		2		1							6,804	734		
TOTAL	5,839		337		57								7,538			
UNKNOWN FUEL																
STAKE																
TRACTOR																
VAN																
UNKNOWN																
TOTAL	5,842		337		57								7,547			

SOURCE: R. L. POLK & CO.

Permission for further use must
 be obtained from R. L. Polk & Co.

Table C-9

NINE-COUNTY NEW YORK CITY AREA

NUMBER OF VEHICLES REGISTERED BY BODY STYLE, GROSS VEHICLE WEIGHT AND FUEL TYPE
10% SAMPLE OF LAST 10 YEARS MODELS - 1971

BODY STYLE	GROSS VEHICLE WEIGHT - POUNDS																TOTAL	
	G - GASOLINE						D - DIESEL											
	6,000-10,000		10,001-14,000		14,001-16,000		16,001-19,500		19,501-26,000		26,001-33,000		OVER 33,001		TOTAL			
	G	D	G	D	G	D	G	D	G	D	G	D	G	D				
BUS	16																122	1
COMPACT VAN	463																463	
DUMP	128	1															622	119
FLAT-BED	42																229	22
HOUSE-CAR	12																15	
MOTOR-HOME	4																4	
PANEL	372	5															620	18
PICK-UP	1,069																1,088	
REFRIGERATOR	9																95	15
STATION BUS	28																	28
STAKE BODY	237																611	10
STATION WAGON	62																68	
TANK	2																198	90
TRACTOR																	272	321
VAN	261																1,700	102
VAN-CAMPER	1																1	
WRECKER	128																170	3
UNKNOWN	234																508	33
SUB-TOTAL	3,068	6															6,804	734
TOTAL	3,074	155															7,538	
UNKNOWN FUEL																		
STAKE																	1	1
TRACTOR																	2	2
UNKNOWN																	3	3
VAN																		
TOTAL	3,074	155															7,547	

SOURCE: R. L. POLK & CO.

Permission for further use must
be obtained from R. L. Polk & Co.

Table C-10
NINE-COUNTY NEW YORK CITY AREA

NUMBER OF VEHICLES REGISTERED BY WHEEL CODE, GROSS VEHICLE WEIGHT, AND FUEL TYPE
10% SAMPLE OF LAST 10 YEARS MODELS

WHEEL CODE	GROSS VEHICLE WEIGHT - POUNDS																
	FUEL TYPE:				G - GASOLINE				D - DIESEL				OVER				
	6,001- 10,000		10,001- 14,000		14,000- 16,000		16,001- 19,500		19,501- 26,000		26,001- 33,000		33,000				
	G	D	G	D	G	D	G	D	G	D	G	D	G	D	G	D	
42 2-AXLE/2 WHEEL DRIVE	2,621	5	129	2	712	22	673	1	1,121	67	223	144	74	45	5,553	286	
44 2-AXLE/4 WHEEL DRIVE	334	1					1			1					335	2	
49 2-AXLE/UNKNOWN	4								52	1					56	1	
SUB-TOTAL 2-AXLE TRUCKS	2,959	6	129	2	712	22	674	1	1,173	69	223	144	74	45	5,944	289	
64 3-AXLE/4 WHEEL DRIVE																	
69 3-AXLE/UNKNOWN												3	91	106	91	109	
SUB-TOTAL 3-AXLE TRUCKS														1		1	
99 UNKNOWN	109		24		65	1	124	37	225	24	85	113	137	160	91	110	
SUB-TOTAL	3,068	6	153	2	777	23	798	38	1,398	93	308	260	302	312	6,804	734	
TOTAL	3,074	155	800	836	1,491	568	614								7,538		
UNKNOWN FUEL 42 2-AXLE/2 WHEEL DRIVE					3											3	
							1			1		1	1			1	
TOTAL	3,074	155	803	837	1,492	569	617								7,547		

SOURCE: R. L. POLK & CO.

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